Automating library procedures
Automating library procedures:
a survivor's handbook

Ian Lovecy
Indian Edition 1984

First Published in India in arrangement with
Library Association Publishing Limited, London
by D.K. Agencies (P) Ltd.
H-12 Bali Nagar, New Delhi - 110015


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Printed in Great Britain

British Library Cataloguing in Publication Data
Lovecy, Ian
Automating library procedures.
1. Libraries—Automation  2. Library
administration
I. Title
025'.0028'54      Z678.9
ISBN 0 85365 516 2
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To my wife and daughter, whose support and encouragement have been invaluable

Ego autem coacervavi omne quod inveni.

*Nennius*
As far as library automation is concerned, I am a survivor, not an expert. I am not now as naive as I was four years ago, and Reading University Library is still working; perhaps the worst is now behind me. This book is the book I wish I could have found when I started, to warn me of some of the pitfalls ahead and to give me advance warning of decisions I would have to make. It is not an account of ‘how we done it good’; indeed, in the following pages I have tried to be honest about how we failed at times — and by ‘we’ I really mean ‘I’, since the wrong decisions were mainly mine. I hope that others can learn from my mistakes without having to make them first.

So far as I could, I have kept the book to a practical level. Policy and philosophy inevitably get brought in, but my concern has been with the effect of automation on the day-to-day operation of the library. This is, after all, the province of the deputy, and the one area in which I have some claim to knowledge. If the book helps some people to clarify the issues which automation raises, to begin to evaluate possible solutions to their problems and finally to survive themselves, it will have succeeded. If it helps others, perhaps starting on a career in librarianship, to understand something of the difficulties of the decision-making involved, that will be an added bonus.

As far as possible, I have tried to avoid jargon. Sometimes
to do so would lead to the replacement of a short phrase by an excessively long periphrasis, on other occasions a jargon term has become so common in usage that to avoid it would seem unnecessary pedantry to those with any background at all in the subject. For those who may be starting out in this area I have appended a glossary; this is based on the excellent glossary published at the end of each issue of *Vine*, which I commend to the attention of beginners in library automation.

I have received much help and encouragement from many quarters, too much for it all to be acknowledged individually. However, I must acknowledge the ready help given by Graham Chan of Liverpool Polytechnic Library, and Norman Turner of Motherwell District Libraries; by former colleagues at the John Rylands University Library of Manchester, especially Charlie Hulme; and by John Ashford, whose sympathetic editing has removed the worst of the incoherence and bias. Among my present colleagues at Reading I must acknowledge my debt to Pauline Dingley and Conny Michael, who worked closely with me in the implementation of the systems and kept me firmly down to earth; to Joan Hadley and Angela Heap who read chapters and made disconcertingly perceptive comments; and of course to James Thompson, who has not only allowed me to experiment on his library but whose support encouraged me to start writing. Finally I wish to thank most sincerely Katie Power, who typed the manuscript and whose diligence and encouragement ensured that this work reached completion.
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Introduction:
why have a computer?

The computer is in danger of becoming, if it has not already become, the librarian's macho symbol. To admit to working in a library which is not computerized is to imply that your place of employment is small or backward; and such an admission is usually hastily qualified by the explanation that computerization is being considered. Perhaps this is not surprising in a society where computers have not only found a place in that literally down-to-earth business, farming, but have become a major part of the leisure industry — whether defending earth against space invaders or helping imaginary frogs across motorways. We seem very close to Huxley's *Brave new world*:

Nowadays the Controllers won't approve any new game unless it can be shown that it requires at least as much apparatus as the most complicated of existing games.¹

Certainly those who put their faith in something other than electronics are in danger of being regarded as deviants.

Librarians are a part of society; it is therefore not surprising that they fall sometimes into the trap of believing that technology will answer everything. Too often, however, computers are introduced into libraries with more than a little element of 'keeping up with the Joneses', and a faith that 'the future lies in automation'. Library automation is a major undertaking
which requires a positive operational justification, an examination of the pros and the cons, and a realization that it will, in the course of time, change the whole nature and approach of the library. Whether that change will be for the better or worse will depend on three things: how the introduction was undertaken; how reasonable were the original projections of what could be accomplished by the use of the computer; and how realistic were the objectives in library terms.

The initial impetus for the introduction of a computer is often the existence of a problem area where the service does not match the standards the librarian wishes to reach. However, computers are not magic. You do not change a library with serious operational problems into a place where all readers receive all the books they want in what they regard as a reasonable time just by the wave of a light-pen wand. The kiss of a computer will not turn frogs into handsome princes, nor lifelong cataloguers into extrovert multifunction subject librarians. Some of the failings of a library may be solved, or alleviated, by the use of a computer; others will simply be automated and produced in milliseconds rather than minutes or hours. Moreover, one of the few laws I recall learning in physics lessons is that the universe works as a balance, and what you take off one side you have to put on the other; it is thus not surprising to find that for every saving made by a computer something has to be put on the debit side.

What I hope to do in this book is to clarify the questions which librarians must answer if they contemplate automation, and to indicate the penalties — or at least the changes and limitations — which fill the other pan of the scales, and which are frequently only discovered by bitter experience. Too often the fact that there are problems in the running of a library leads to a desperate faith that computerization will provide a solution. The main problems are shared by many libraries: cataloguing backlogs, large files which consume ever more staff-time to maintain, and increasingly these days insufficient staffing levels to run all but the most basic of circulation and acquisition services. However, the mere fact that a computer can perform its operations in a fraction of a second only provides a solution if these operations are
relevant to the problem. It is because of failure to appreciate this that there sometimes grows up a feeling, more among middle-rank and junior staff than at the top, that computers do not work. They do; but only if they are applied in an appropriate way.

So where a problem exists, it is important to analyse it and not make assumptions as to its nature. A cataloguing backlog may result from too few staff relative to the number of incoming books; or from too little effort by such staff; or just from poor departmental organization in which the more difficult books are put aside indefinitely and high-quality catalogue maintenance is allowed to take a higher priority than new cataloguing. There is no reason to assume either that the introduction of a computer will cure any or all of these problems, or that there is no other solution. Priorities may be set and maintained by a competent departmental head in a manual system — although he or she may be assisted by the ability of a computer to produce automatic reminders for books waiting in the pipeline. Staff who work slowly and below their capacity in a manual system are unlikely to metamorphose overnight into hard-working operators of a computerized system merely by its appearance on the scene — worms do not turn into butterflies! Where the problem is one of insufficient staffing, thought may have to be given to changed priorities: Can staff be switched from other duties to cataloguing? Can extra staff be afforded for the same costs (or less) than a computer? Is it possible to shorten the catalogue record and reduce the time taken for its production? Only when the basic problem has been analysed, and the solution visualized, can one see if a computer will assist in the process.

It is important to know what computers can and cannot do. They can count far quicker than the average human; they can compare strings of numbers or letters and put them in ascending or descending order; they can search for a particular set of characters in the data they hold. If they have a built-in clock, they can be told when something should happen, and report on whether it has or has not. Because what is input can be retained as a set of magnetic or electrical impulses, it is easier to modify than is a typescript or
manuscript; this lends itself to the insertion of variables into a standard letter as well as simplified proof-reading.²

The ability of a computer to put items in order rapidly, and to do so in a variety of different sequences or by a number of different access points all derived from a single record, is undoubtedly one of its most alluring attributes to a librarian. It can often prove the answer to the otherwise intractable problem of the maintenance of issue files, which need to be searched by date, by reader, and by title or copy number at least. Here there are physical limitations to a manual system which a computer can overcome; there is a limit to the number of legible copies of a multi-part document which can be produced, and the size of the filing area and the files themselves will limit the number of staff who can operate them at once. The conflict when someone is attempting to file in a tray from which someone else is trying to discharge, while a third hovers irritably at the side waiting to search for reserved books is a problem well known to librarians who have worked with Browne or multi-part-slip issue systems. The fact that a computer may be able to cope with all three activities simultaneously (as far as the user is concerned) from three discrete terminals is clearly a positive benefit.

However, to believe that the filing speed and accuracy of a computer will always be beneficial is to be over-optimistic. A computer sees letters — or indeed values — where we see words; it will work letter by letter through ‘Great Britain: Department of Agriculture, Fisheries and Food’ in a dozen successive records where a human would recognize the similarity of the heading and file a set of cards by title. People apply thought to their filing and will recognize that a heading ‘University of Birmingham’ both needs correction and can be interfiled with ‘University of Birmingham’ even before the correction is made. Such feats of intellect are, at least for the present, beyond the sort of computer most libraries can afford, and library computers will continue to do precisely and infuriatingly what they are told to do.

Herein lies one of the reasons why the savings of staff time resulting from computerization do not always match up to expectations. Staff may have to be more accurate than
previously in their work; they may also — indeed almost certainly will — have to learn some system of formalizing or coding the elements of their work (author, title; book, reader) which may be in effect the acquisition of a new language. Keeping this simple may limit the degree of flexibility within the internal operations of the computer; one is again left balancing savings in one area against extra work in another. Other features of computers may erode possible savings in staff time. Some small microcomputers cannot accept data from the keyboard while they are printing the results of a previous piece of work. If such a machine is introduced, it will save no time — it might even waste it — unless the operator can be found other work to do on such occasions. Similarly, if the change from typing to VDU operation means that a clerical assistant who previously typed all day must now have periodic rests from the green flashing lights of the VDU screen it may in fact be necessary to take on extra staff to ensure that the VDUs are in constant operation. The time both sets of staff spend away from the terminal may, of course, be put to profitable use — but will it achieve any more than the employment of a similar number of extra staff would have done anyway? Of course, the greater efficiencies of the system may provide enough time for periodic breaks, or the VDUs — and the keyboarders — may be of such quality that breaks are not required, but experience in a number of libraries and in other institutions such as banks where computers have been extensively introduced suggests that the danger must be firmly borne in mind.3

In considering the potential staff savings which a computer may make it is important to remember that the beast may need a keeper. Depending on the species of computer system adopted, it may be necessary to pay part of the salary of a programmer in a co-operative; to appoint a systems librarian; or to use — possibly without its showing on the library budget — the services of computer staff of the parent institution or authority. A combination may be necessary: the John Rylands University Library of Manchester has a full-time systems librarian while making use of the programming expertise of the Administrative Computer Unit; Bristol University has a systems librarian who spends the majority
of his time on the maintenance and development of the automated systems although these are provided by the co-operative SWALCAP.

In Reading University Library staff savings were achieved after the introduction of computerized cataloguing, although not quite to the degree originally envisaged. The duplicator-operator who had produced the catalogue cards was redeployed, saving ten hours per week, while the equivalent of one full-time typist has also been saved. More recently the cataloguing operation has withstood the loss of two and two-thirds professional staff, partly compensated for by the introduction of the microfiche catalogue and the virtual cessation of catalogue filing. Some of these savings, however, have resulted from a change in policy in the department towards a less meticulous checking and double-checking of work which might have been achieved in the manual system; the initial effect of the introduction of a computerized system was a substantial drop in output. Against any such savings must also be set the fact that a major part of the Deputy Librarian's time has been tied up in sorting out the problems — hardware, software and operational — of the system.

Computers can produce savings in the staffing budget (at the expense of the equipment budget) if it is accepted that they may reduce not the number but the level of posts — that some aspects of the work may require less intellectual input, perhaps because in a co-operative system reliance is being placed on the quality control elsewhere of records being produced for sharing. Such savings are likely to be made in the long rather than the short term, and they can create problems both of union opposition and of job dissatisfaction for staff at a high grade who continue to be employed on the same, now downgraded, task. These aspects are considered in more detail in a later chapter. Equally germane to the question of staff savings is the consideration of the abilities of the staff saved and the ease with which they can be redeployed. In the case of Reading, it took some time to redeploy the two half-time typists, partly because of their hours but more because the complexity of catalogue typing had led to their being on a grade associated elsewhere in the University with
the possession of shorthand and other secretarial, rather than typing, skills. The professional staff savings resulted from maternity and early retirement, not redeployment. At a senior professional level it may sometimes be especially hard to redeploy saved time, for skills which made someone a good traditional cataloguer — meticulous attention to detail, sometimes bordering on the obsessive; a willingness to work in the 'back room' rather than in public view; a desire to work steadily at a particular task without interruption — are by no means those which make, for example, a good subject librarian manning an enquiry desk and liaising with academic staff. Unfortunately, such staff may equally not adapt readily to a computerized system either, and are almost certainly not the ideal people to put in charge of one. If there are many such staff, it would be foolish for a librarian to dream of switching the emphasis of a library into subject librarianship, for although the number of people needed may be there, the kind will be wrong.

The choice of routes to automation may be limited by factors beyond the librarian's control. The only type of system large enough to cope with the library's needs may require the library to house a minicomputer. In a library with a chronic space problem — the position in a number of university libraries after the Atkinson Report (which introduced more rigorous criteria for qualifying for extensions or new buildings), and even more so in a number of public libraries housed in cramped inner-city premises with no room to expand — this might be a limiting factor overruling all the possible advantages; in physical terms, it simply cannot be done. Space may be found away from the library itself, but this may lead to operational difficulties if some staff have to be based for any length of time near the machine. Cabling in such circumstances may prove too expensive, as it may if a number of branches have to be linked, or even if a large building is to be wired for connections. There may be difficulties about adapting existing circulation desks to take new terminals; the Education Library at Reading University has a fixed counter too narrow for convenience and without easy possibilities of running power cables to the necessary places.
I have mentioned the costs of cabling, but costs in general are frequently a severe constraint. The costs of installing a computer of any size are not small, and do not end with the machine itself. Cabling, terminals, suitable air-conditioning and anti-static carpeting may all have to be added in before the total capital cost is arrived at. Maintenance costs must also be budgeted for, and these being recurrent — and quite high — may give more pause to an authority or institution, simply because they represent an on-going commitment. In addition there may be one-off labour costs involved in the preparation of the bookstock for circulation systems — production and fixing of bar-coded labels or other data-capture devices. The amount of money available may influence if not dictate both the extent of automation and the way in which it is achieved — what class of system can be purchased, the number of terminals, the number of sites which can be brought into the system. The latter may be affected also by telecommunication costs, even if private wires are laid which incur no actual call-charges: lines for three terminals at Reading University’s Education Library, just over a mile from the main campus, cost £1,500 pa in 1983. All these aspects are considered in greater detail in connection with specific types of computer operation.

On the other hand, if savings in the staffing budget really can be demonstrated over a period, there may be a greater willingness to find the capital funding to avoid future calls on the revenue account. As wages rise and labour costs become an increasingly significant element of an institution’s budget, transfer of costs from revenue to capital can make sense — as is seen from the various early retirement or redundancy schemes in operation in both the public and the private sectors. In the public sector there is often — surprisingly — a superfluity of capital, since government is prepared to release funds on an annual basis with no commitment as to continuation in the future. A second factor affecting the availability of such funding is the procedure in some institutions under which unspent amounts cannot be carried forward. Where, therefore, expected decisions have not been made on some major project as the end of the financial year approaches there is often a largish sum of money looking for
a spender. This brings its hazards also: in the panic rush to spend before a deadline, decisions which should receive consideration may be hurried through, and the resulting system suffers.

Computer equipment has a more limited life than that of more conventional library equipment — desks, trolleys etc. Moreover, as well as wearing out it suffers from obsolescence. It may seem wasteful to write off a system which appears to work simply because better equipment is now available; there may however be no alternative if the manufacturers cease to produce spares for their old range, and maintenance firms refuse to service it. Since academic institutions and local authorities do not amortise their capital over a number of years, as does most industry, it can be difficult to argue for replacement equipment when necessary; financial controllers may have a very unrealistic expectation of the intended life of equipment. Particularly in cases where capital funding is being sought as a means to save on revenue, the librarian needs to make quite clear the need for future replacement of equipment or of the complete system, and perhaps to have some of the revenue savings earmarked for his future use. This may make acceptance of the original proposal more difficult; but the alternative will store up a future problem for the librarian or a successor, and in truth is scarcely fully honest.

Unless there is a clear benefit in view — improved service, budgetary saving or whatever — there is little justification for considering the more detailed questions relating to particular systems. However, because costs will figure high in the list of factors in the decision-making, the question of the size of the system — micro, mini, mainframe — and its administrative set-up — turnkey, home-grown, co-operative — will also be involved at an early stage, before the final decision on computerization can be made. The initial decision is on the \textit{prima facie} case: is my problem one which might be solved by a computer? The second, and dependent, stage relates to the feasibility of introducing a computer.

There are two general points to be made which need not then be repeated in discussing particular applications. The first concerns the choice of an on-line or batch system. There
is a general tendency to assume 'on-line good, batch mode bad', a feeling that since a computer can produce totally up-to-date information that is what it should do. There is sometimes confusion about comparisons with manual systems. 'We have always been able to go to our files and see them as they are that moment', people say; 'now you want us to work from a print-out produced overnight'. Such an attitude may leave out of account that the files they inspected lacked the cards in the awaiting filing tray, or which had not yet been brought from the catalogue room. There might indeed be some occasions when a manual system was completely up-to-date while a batch computer system was not; but there will be many occasions when the computer system will be nearer currency than the manual system was.

More importantly, this sort of total currency is by no means necessary for all operations. Naturally, the status of a book in the circulation system needs to be up-to-date for practical purposes. No one, however, wants reports that a book is overdue that minute; we usually accept that return on the appropriate day is sufficient for normal loans (special short loan collections may be different). Who would want a VDU indicating that reminders were due to booksellers at the precise hour of the day at which the order was originally placed? — if nothing else, the book might be in the pile of post not yet opened. For certain operations, therefore, batching actually assists the efficiency of library work — and it may even be batching by the week rather than the day, when it comes to items like long overdue books. (It is useful to know if a particular reader has a number of such books, which may not all have been issued on the same day of the week.)

For input, too, some batching may make sense in terms of staff utilization. The Mark 2 SWALCAP cataloguing system allows a record to be requested on-line and (if found) transferred immediately to the files of the requesting library. Because this system is intended to provide the most flexible way of acquiring a record, it involves a terminal dialogue (Figure 1.1), and although this can be kept fairly simple it is nevertheless more time consuming than the straightforward batch request on the Mark 1 system (which is to be duplicated
shortly on the Mark 2 system). Where the probability of 'hits' is high it makes more sense for a typist to key in a whole series of requests, with no dialogue, to be satisfied overnight. There are not many cases where the cataloguers are so desperate for work that an overnight process will leave them twiddling their thumbs! The on-line system is more useful where 'hits' are less certain, but its efficient operation requires the use of library, rather than clerical, staff. This may have cost implications, as also will the use of time on the main computer at a period of the day when heavy demands are being made of it.

The point at which the batch/on-line argument blurs is in dealing with the updating of data files such as catalogues. It would be pleasant to think that as soon as a book was ordered the record existed in the system, minimizing the likelihood of duplicate purchase. It would be good to think that as soon as the catalogue record was completed it was available to readers. On this latter point, of course, this has seldom if ever been the case in libraries since cataloguers ceased to write directly into public catalogues; moreover it is unlikely at that point that the book has yet completed its progress through the various areas of processing, and the reader would therefore have to satisfy himself with the record alone for a few days. In all these cases compromises will be the inevitable result, balancing the costs involved in the design and operation of the system against the resulting convenience. Frequently the result will be files modified periodically with supplementary 'live' files, involving users in
double look-up as the price of currency. Here, however, as in so many areas of library computerization, the technology (in this case of storage) is undergoing such constant change that design decisions will need periodic revision.

The second general point concerns scale. There is a level at which a system can run manually quite efficiently, and at which the time saved by introducing a computer by no means matches the cost of that machinery. In a library with fifty issues a day, computerization of the circulation system would indeed be overkill. At the same time, such computerization as a by-product of something else may make sense. To quote an example from Reading again, the annual issues at the education library are about 20,000. At this level it would probably not have been worth introducing a £70,000 minicomputer plus terminals to join the SWALCAP circulation system. However, the minicomputer already existed in the main library, and all that was required was the purchase of two terminals at £850 each (to be written off, mentally, over five years) and the installation of two private lines with rental of about £1,000 pa. It is probable that the staff time saved in filing, dealing with overdues, and all the other general work connected with a manual system will more than cover the £1,350 pa and the costs of computer time at SWALCAP; in addition readers benefit from a more up-to-date circulation system, and the ability to access information about main library copies from the education library and vice-versa.

This is not to say that a librarian should go out and buy the biggest computer he can with the money he has. Unless spare capacity can be used in the foreseeable future — either for further extensions of the system, or for separate functions such as word processing or possibly accounts, the machine may prove a white elephant — for the very reasons of limited life-span mentioned above. To have bought overkill capacity and have to change the equipment before it has been used is by anyone’s standards a waste of money. Moreover, advances in technology may well mean that the cost of extra capacity, in a few years’ time is significantly less than at present.

At the same time, it is not advisable to tailor a system’s size too closely to the operation as it exists. Easier use may
provoke greater use; catalogue files, except in the most rigidly Atkinsonian of libraries, grow constantly. Some spare capacity is necessary right from the outset, if only to deal with miscalculations, unexpected contingencies, or administrative decisions (such as the opening of new branches or the change of loan regulations) which significantly change the library's operations. Projections must be made of the likely growth of the service in question, together with predictions about the life of the system. (It should incidentally be remembered that changing equipment may involve the lengthy task of restructuring data files, and should not therefore be contemplated lightly as the way to extend the service in the future. More is said on this in chapter 6.) The future addition of other operations to the system must also be considered, both in terms of what they will do to storage and processing requirements and in respect of the number of terminals the system would need to support. Starting a cataloguing system at Reading University in 1979 with three terminals, the potential growth to twenty-four seemed entirely adequate even given the likely addition of circulation; the maximum has, three and a half years later, already been reached, and further terminals could usefully be deployed in the periodicals department and the law library were the facilities available. In the light of this, predicting the number of ports which the campus computer network would need to a library computer offering an on-line catalogue will prove extremely difficult.

Intimately related to the size of the machine is the speed of operation. A microcomputer may be able to handle the file storage required, but it may not be able to process an operation in a reasonable time. Unless the machine can file and retrieve at least as quickly as a human being, its use is limited; moreover, there is an expectation of speed in relation to a computer that makes a 60 second delay intolerable even where the manual operation took two minutes. I have already mentioned the difficulties associated with a machine which prints only to the exclusion of all other work; equally some machines can support a small number of terminals, but not their concurrent operation. It is worth remembering that most microcomputers are geared to office and business use,
and this is even more true in respect of available software. Library files are often much larger, and much more textually-based, than the sort of files for which these machines are designed.

The remaining considerations relate more to specific areas of library operation, or to specific methods of undertaking computerization. These are discussed in the following chapters, and the issues raised will both form part of any feasibility study — because of their relation to costs and space requirements — and indicate questions which have to be answered as to direction when the basic decision is taken. As in so many aspects of library work, however, the isolation of one particular area may be misleading, and I have therefore added a chapter discussing the possibly different questions related to an integrated approach, and the interactions this must take into account.

References

2. Ashford, J H 'Selecting an appropriate system' in Williams, H L (ed) Computerised systems in library and information services. ASLIB, 1983. 16 sqq.
3. See for example the trade union publications Automation & the office worker (1980) and Office technology: the trade union response (1979), both published by the Association of Professional, Executive, Clerical and Computer Staff; or Guide to health hazards of visual display units, published by the Association of Scientific, Technical and Managerial Staffs.
4. Hawes, D F W and Botten, D A Library automation at the Polytechnic of the South Bank. London, 1983. 120.
5. The operation of the system, with particular relevance to its use at Southampton University, has been described in Vine 50 October 1983. 5-13.
6. For a discussion of the use of commercial software, see Paul Burton 'Software off the shelf: in-house information with a micro'. ASLIB Proceedings 35 (9) September 1983. 335-45; also his British Library R & D Department report Microcomputer applications in academic libraries (Library & Information Research Report no 16).
In all libraries there is a clerical side which, while essential to the running of the library, makes no real use of truly library skills. There are letters to be written (other than overdues or reminders to booksellers); reports to be typed; references for present and former staff to be given; guides and booklets to be produced. On the financial side there are usually accounts to be kept locally (as well as centrally in the authority or institution); budgets to be prepared; interim statements to be prepared; final year accounts to be presented; and possibly receipts from photocopying, fines, reservations charges, on-line search charges, and sale of publications, postcards or badges to be recorded and set against appropriate heads of expenditure. While these areas are not usually in the forefront of the minds of those aiming to computerize libraries, they do lend themselves to this partly because they may be able to use software produced for general commercial applications.

The office

'The office' as such may not exist in the library, since it may consist of a number of clerical assistants (or even library assistants with typing abilities), whether scattered throughout the processing departments or centralized, who type letters,
reports, guides, catalogue cards, orders and overdues as required. This will particularly be the case in smaller libraries, and I shall consider the implications when looking at the question of the integration of the office into the whole library. For the moment, however, I wish to look at the office as an office, assuming that it concentrates on the sort of general typing referred to in the opening paragraph, and probably also copes with the maintenance and filing of staff records and of at least the senior staff’s correspondence and reports. In some respects as an office, it is no different from any other (except perhaps that being in a library one expects even more efficiency in retrieval of information). However, I shall not repeat the considerable amount of material on automating office practice which can be found in the general literature; instead, I shall concentrate on the automation of office functions in the context of a library.

Word processing is often the starting point. Like computers in general, word processors have become a status symbol — and a pain-in-the-neck when what looks like a personally addressed letter turns out to be only a ‘personalized’ circular. Many communications — information memoranda as well as advertizing literature — are best left as circulars, and do not benefit from the ‘Dear Fred’ approach. For other documents, however, there is a standard format with individual variations. Overdues are the classic library example, which have long been prepared as a duplicated form letter (printed in less stringent times) in which the details of the specific book may be written by hand. This is indeed a satisfactory way in which to cope with non-automated overdues; the use of a word processor solely to avoid the form-letter look is not worthwhile, unless the library also wishes to introduce a wide variety into the content of the letter itself.

Other letters, however, must be personal, even if they come out the same. A librarian receiving over a hundred unsolicited job applications is likely to reply in much the same way each time; but each one should be a personal letter, to show that each application has been individually considered, however briefly. Occasionally slight variations in the reply may be necessary. Here a letter stored in machine-readable form, and capable of being edited on reproduction,
can be useful. References for any one individual, too, will contain the same core information — dates of service, departments worked in, health and attendance records — but will require modification to take account of skills newly acquired or the needs of the particular post applied for. A clearer case for word processing facilities can be made for reports — not only the librarian's annual report to his governing body, but also internal reports on organization and administration. These will frequently pass through two or three drafts before reaching final form, often with large elements remaining unchanged; here the facilities of a word processor can assist in the speed of production and, especially, reduce the proofreading required. Often the range of typefaces and sizes is greater than that of typewriters. This, together with centring facilities and automatic justification of both margins, can assist greatly in the presentation of material.

Presentation becomes of even greater importance when the document is a guide or information booklet. In these cases the ability to update small sections of a longer work — to cope with changed locations in the library, for example, or to update a list of useful reference works without complete retyping even if the pagination is affected — is a boon to any typist in the library. The alternatives, of correcting used stencils or producing booklets in loose-leaf form, are time-taking and unsatisfactory for typists and users. The usual solution is the re-publication of out-of-date information, and it is of no small benefit to users that the use of word processing facilities means that such booklets are then updated more frequently. This point applies also to staff manuals, lists of staff, internal telephone directories, inventories, and other internal documentation.

Nevertheless, although there are a number of items such as these which do lend themselves to the application of a word processor, it is worth considering what proportion of the total office work they represent. At certain times of the year it may be higher, but overall it is probably no more than 50% — and may of course become less if efficiency is improved by introducing a word processor. How will the use of a word processor affect the remaining work? Will it appear again as an unnecessarily complicated way of coping with office
routines? If all that is to be gained is the ability to make corrections yet produce perfect copies without retyping, to change elements in letters without risking the resignation of a secretary, then its value is largely cosmetic. Even the possible saving in the secretary’s and the librarian’s time may not be worth the money or the space. On the question of space, the fact that a word processor consists of a screen, a keyboard, a processing unit and a printer may make it difficult to fit in an office; the type of printer will affect this, for while a daisy-wheel printer may be little worse in terms of noise than a typewriter, dot-matrix printers tend to have a screeching element in the sound. If the printer is felt to be unacceptable in a normal office environment, the whole machine may be tucked out of the way; consequently a secretary using it will be unavailable to deal with the telephone or personal callers. There may also be greater reluctance to use a machine set apart from the familiar office surroundings.

These are some of the hidden drawbacks which may be involved in using a word processor. Proofreading on the screen can save paper by allowing the correction of trivial errors before printing. However, stationery — particularly if continuous stationery is needed — becomes more expensive, while if different sorts of stationery (headed, unheaded, etc) are needed someone has to watch over the printer to ensure that it is appropriately fed. Ribbons often cost more than for an ordinary typewriter, and word processors seem to have a more voracious appetite for them. Training is yet another area of hidden cost — not only the initial training which needs to be done on installation, but the training of each subsequent appointee. Frequently the costs of installation include a sum for training by the supplier; this, however, is usually only a minimal amount of time, perhaps one day spread over two half days, leaving the rest to be completed by the operator in practice, error, and perusal of the manual. During this period, the duration of which varies with the person involved, productivity will slump. (Incidentally, there is much to be said here in favour of using a local supplier, if reliable in terms of servicing; they may be more willing and available to answer queries and problems as they arise than a large firm some distance away, despite the latter’s possibly
greater expertise.) Training of new staff will either have to be paid for (if available at all) or carried out internally. In these days when there is more likely to be a three-month gap between resignation and new appointment than a time of overlap, this presupposes more than one member of staff able to use the equipment. This is desirable anyway, since otherwise leave or sickness can lead to certain jobs in the office not being possible; staff can no longer just be drafted in from other areas.

Where the office employs more than one member of staff, further problems may arise. The sort of task which best uses a word processor is often of a routine nature, although at times reports and papers will in fact be highly confidential. One can face the almost insoluble staffing problems of the more senior secretary having to carry out much of the routine work; or of the more junior secretary being more familiar with the sophisticated equipment. Both may have to have terminals — a further expense, although possibly justified by the ability to use one while the other undergoes repair. In Reading University Library, where Olivetti electronic typewriters were preferred to a full word processor, it became necessary to buy a second to make profitable use of secretarial time. This showed benefits in terms of always having one machine, complete in itself, available for use, and in eliminating the potential for squabbles, but it meant a high initial capital cost which will take some years to recoup.

Electronic typewriters, as opposed to full word processors, were chosen at Reading partly for the sort of space considerations outlined above, but also because some of the facilities available on word processors were felt to be unnecessary. A really high-speed printer is pointless when the majority of work is single letters, while having typewriters as well as word processing equipment was definitely too expensive an option. Some (although not great) cost savings were made over the more sophisticated equipment, while the Olivetti machines had certain features — quality of print, the ability to enter on the keyboard while the machine is printing — not available on the cheaper microcomputers with a word processing capability. The decision enabled space and money to be found for the purchase of two machines with
the greater flexibility that that allows. This emphasizes the importance of deciding which of the marvellous facilities offered will actually be used. Yes, it would be nice to have graphics — but how often will they really be essential to a document, rather than a useful addition? How often does one want to index the sort of document produced in a library?

It may be possible to make use of a computer purchased primarily for other library processes for word processing — and even for filing if this is desired. Such spare capacity may exist on a dedicated academic library computer with capacity for statistical or other analysis of large files which is carried out only infrequently. In such circumstances it becomes important to ensure that general office software is available for the chosen machine. (The various considerations to be borne in mind when choosing commercial software are considered later in relation to library systems as well as to office work.) Such a system has obvious advantages for the sort of library in which the secretarial work is distributed among a number of staff all of whom would have access to a terminal in the course of other library duties. It also has the advantage that material produced by the basic library system — statistical data, for example — can be edited and formatted using the word processing software. Reports can call on statistical data from current files which will therefore be fully up-to-date. The ability to perform library operations and office-style work from a single terminal is obviously of great advantage. Against this must be set the fact that while the storage facilities of a machine may cope with the requirements, a library computer may be working close to its processing capacity with a high volume of issue transactions or of cataloguing. In such circumstances the addition of one or two terminals using word processing facilities, which use a large volume of core memory, may increase response times on the system generally to an unacceptable level. Other methods of coping with varying operations from a single terminal are discussed in the chapter on integrated systems.

It is worth mentioning at this point the question of compatibility. There is nothing so frustrating in the world of computers as the inability to use on one machine something designed for or produced on another. It is not often possible
to take a mini-floppy disk from one microcomputer and feed it into another of a different make; nor to connect it to a mainframe without checking the existence of an appropriate 'handshake'. There is therefore a lot to be said, if different machines are being bought for different purposes, for sticking at least to a particular make or family of machines, between which data transfer may be easier than between machines of totally different pedigree. It is also important to look to future use in external communications. The Olivetti electronic typewriters already mentioned are likely to be able to be modified for use with the planned British Telecom teletex network. In the context of their use in the library office, this, with its potential for transmitting the text of a letter rather than using the postal service, is probably a more useful facility than the ability (which they do not have) of communicating with the computing facilities used for library processing. Electronic mail has been present in libraries for a long time in a primitive form — we call it telex. The concept has now been extended by the availability of computers to allow not only the transmission of messages electronically, but access to data — files, previous correspondence — held in machine-readable form from any suitable terminal; perhaps even from miles away by telephone link. This has led to the concept of the (so-called) 'electronic office' with its 'workstations'. Attractive as it may be for a librarian to be able to retrieve any file from his desk without calling his secretary, or to deal with urgent mail or reports from home or the golf club, the concept is really only appropriate to a large organization in which there is a high volume of internally-produced communication. Most of the average library's contacts are, and for a long time will continue to be, with the outside world via the written word. Unless all this incoming post is entered into the machine — a major task of dubious benefit — ordinary files will still need to be referred to, and remote access will not be possible. The greatest benefits to libraries of this area of technology are likely to be found in communications between central libraries and branches, between libraries within geographical areas, and between users and the libraries. It is therefore in the area of external communications, local area networks and
packet switching systems, that compatibility should be sought, rather than following the will o' the wisp of technological fame through the marshy ground of an electronic office.

Accounts

Compatibility is a question which looms large in choosing and designing accounting systems for a library. Usually there are two systems with which compatibility might be desirable: the library's own system (so that bibliographic data or borrower details could be associated if necessary with accounts records), and the accounting system of the parent body, which is usually responsible for actual payments. The library's accounting system may be no more than a terminal on the accounts system of the main body. This is not usually a practical solution, since finance officers do not relish staff not under their control having access to their systems. Typically, then, two main system computers will be involved, and the library's accounts may be run on a separate microcomputer. The justification of library accounts separate from those of the parent body is a question of volume and detail. The number of purchases made by a library is usually higher than those made by any other non-trading departments of an organization. Moreover, they involve a large number of payments in advance — for most serials and some books — and there will often be queries as to whether invoices have or have not been received or passed for payment. Where all the accounting work is separated from the library, checking up on such matters can be very slow, and the chances for mistakes much greater. In cases where invoices or statements are sent direct to the finance office and do not accompany the book, there can be dangers of double payment or payment without supply of goods.

In the case of academic libraries, especially, the division of a main account into a number of sub-accounts to enable the analysis of book purchase by academic department introduces a degree of detail which a main accounts office could well desire to be spared. The keeping of commitment accounts on such a large number of purchases may introduce complexities
into a system which otherwise copes well. A high proportion of academic library transactions tend to be in foreign currencies, and this further complicates the system.

Details of the position of these funds may be required at short notice — a lecturer wishing to purchase an expensive book will not care to wait a day or more for a statement of whether his fund has the money; central accounts, dealing with a large number of departments, cannot be expected to respond in this fashion. Producing future budgets, and controlling these budgets, may involve a degree of analysis which a central finance department is not, and should not be, geared to performing; patterns of spending, the likelihood that orders will be satisfied within a financial year, the likely production of volumes in a series for which there is a standing order may call for a professional library input as well as financial expertise.

In accounting terms, an average academic library with a non-staffing budget of £521,000 is firmly in the small business class. The basic account is a purchase account — or rather a series of purchase accounts — working to a budget figure. In addition, however, there are in most libraries some trading accounts — inter-library loans, for example, where money is received for loans made by the library, or sales of publications. Photocopying is a good example of such a trading account — at Reading University Library there is an annual cash intake of between £40,000 and £50,000. Where the library is funded separately for the purchase of furniture and equipment — from the university’s UGC equipment fund, for example — there is a place for a capital account, especially if this can be used for producing an inventory. For the purchase accounts there may be a need for both ledger and journal entries. All these types of account are basic business accounts for which commercial software exists.

The differences are, however, quite marked. Libraries do not normally pay out money, so the facility to produce cheques is not required. Their work is essentially book-keeping, and the degree of analysis required is substantial, with perhaps 50 sub-accounts to one account. Moreover, they frequently wish to keep several references associated with the sums of money — order number and accession
number as well as invoice details. For retrieval purposes order number and library fund are more likely to be useful than supplier, which is the normal method for a purchase account system. For these reasons the answer to computerizing accounts may lie not in commercial accounting systems but either in home-developed versions (as used by Edinburgh) or in the adaptation of a more general data-handling system, such as Compssoft DMS or Delta (the approach taken at Reading). This latter is to be run in conjunction with a budgetary and analysis package (Budget, developed by Care Computer Store), which produces the management data which was the primary purpose for computerizing the accounts system.

The amount to be gained from computerization will depend to some extent on the detail in which accounts are kept manually. There will always be a gain in management information, in quantity and currency. The less an accounts assistant had to do in a manual system, and therefore the less savings in staff time there are to be made, the greater will be the new information for management. In the case of book purchases, all librarians know that there are peaks and troughs for ordering, varying speeds of book arrival, and a proportion of ordered books which turn out to be unavailable. Controlling a department’s expenditure so that it neither over- nor under-spends substantially is an art, since one cannot assume a regular expenditure each month. A computer can give a pattern of spending for each department — probably a good week’s or fortnight’s work for an accounts assistant in a medium to large library — which can be analysed (bearing in mind such complicating anomalies as artificial restrictions because of suspected over-spending, leading to a flood of orders at the beginning of the new financial year). Experiments can be made, and the current year’s pattern can be compared with a previous year’s, either in cash or percentage terms. Some systems provide for a monthly as well as an annual budget figure, and if this is set in conformity with the observed spending pattern it can provide useful early warning of imminent overspending. Moreover, as long as suitable indicators are entered, it is possible to discover average prices of books bought for each department; and
average prices for foreign books — even if desired specifically by country of publication — separately from British. This is of great value in estimating the cost of unpriced orders for the keeping of commitment accounts, as well as perhaps being a factor in making the initial allocations to departments. The keeping of a commitment account, invaluable if tight budgeting is necessary, is made very much simpler in a computerized system; such a system can also indicate the amount by which commitment figures — estimated or drawn from pre-publication literature — are under- (or over-) shooting the actual price, and can then adjust all remaining commitment figures in the account upward by the appropriate amount to give a more realistic picture.

For serials subscription accounts a computer can set the price paid to date against the prices paid for those same titles last year to give an indication of whether the allowance made for inflation has been accurate or not. I remember establishing a manual system for this at UMIST, in which cards for each title were transferred from an ‘unpaid’ to a ‘paid’ file; the relative positions for two years could be assessed by taking the cards in the ‘paid’ file and adding first one year’s entries and then the other year’s. Even with the relatively small number of titles taken, it was not a task to be undertaken lightly. It would have been possible, theoretically, by using edge-notched cards, to have produced breakdowns by subject, or by country of origin, and to do the same for the titles remaining unpaid — quite important when many subscriptions are for foreign journals, and the pound is in one of its rapid descents. The size of the task ruled it out. It could, however, have been performed relatively simply by a computer which would also have produced in a rather better form the other useful product of my manual system, a list of subscriptions thought to be ‘live’ for which no invoices had been received. This was needed both for chasing invoices and checking that copies of the journal had in fact come. In the manual system this could only be coped with at the end of each financial year — by which time if the supplier had thought that the subscription had lapsed and had not sent issues it was usually too late to obtain them. A computer could produce such a list each month, enabling far better
control over accidentally lapsed subscriptions. This raises the question of direct interface between a periodicals accounts system and an automated check-in system, if used, which will be discussed further in connection with general integration of systems.

In the case of both book and serials accounts the computer would, to my mind, be being used correctly. None of the operations would be impossible to achieve manually, but they would take time to carry out. The time would largely be spent in filing and refiling, and in performing mathematical calculations; both are tasks for which a computer is well-suited. There would obviously be a scale of operation below which computerization was unnecessary — 500 serials titles could be handled manually with sufficient accuracy, 5,000 probably could not. Equally one would have to assess the degree to which the information could be used to any purpose. If all subscriptions are placed through a single agent sending one main invoice (even with a number of supplements) the information regarding inflation and currency variation could largely be obtained from comparing the two invoices — and there would be no further payments to affect. Where, however, a library uses one or two subscription agents but also receives a number of journals direct — the position of most university libraries — this information could help with revised mid-year budgeting.

Mention of the number of subscriptions, and for that matter the number of book invoices, leads to the question of the size and format of files. Unless there is a large amount of spare capacity on a computer used for other purposes, an accounts system is likely to be thought of as suitable for a microcomputer. However, a medium-sized academic library taking about 4,000 periodical titles and purchasing in the region of 16,000 books pa is likely to be dealing with 5,000 invoice transactions a year. Since each book on an invoice will be individually entered, and sometimes multi-entered if the cost is being shared between a number of departmental allocations, there could be 30,000 records created each year. As well as information on price and fund, these records need to contain a key to the order data (if this is not all present) and to the bibliographic data for received
items. These will normally take the form of order number and accession number respectively, but the latter may be replaced by a brief description in the case of equipment or other purchases not entered in the accessions register at the time of payment. Unless double consultation of accounts record and order files is always wanted, the supplier must be included also — perhaps in coded form, with (possibly) automatic reference to a full file of supplier details. For a 30,000 record system the space required by even this minimal information, together with the actual programs, may make only the larger microcomputers suitable.

It is also essential to consider what use may be made of the information. There are two distinct approaches: the purchasing history of an individual book and the payment or non-payment of specific invoices. As long as for auditing purposes payments against invoices can be traced to a particular copy of a book, it may make sense to keep both these approaches separate — even at the cost of some double entry of data. Local fields of MARC or other catalogue records may be used to record details of supplier, price and invoice number, normally entered in an accession register. The accounts system may then not need to be indexed by the accession number (with a saving in disk space). Ideally, the data entered into the MARC record would itself be copied as the accounts record, but here the question of compatibility becomes significant again — can the data be removed in a format which the accounts system can use? An alternative approach, running an accounts system on the MARC record, has a superficial attraction if a large machine is available. However, apart from the large number of long records which need to be processed each time, this approach can lead to the creation of pseudo catalogue records for every item of equipment purchased, merely to include them in the accounts system. In assessing the desirability of an automated system, it is also important to consider what implications it has for the ordering process. It may not be possible to make special arrangements for standing orders unless these are never mixed with monograph orders on the same order number. It may even be essential to use a unique order number for each item ordered.
One further benefit which may be gained from computerization of an accounts system is distribution of access. This is a feature which may be present in any computerized system, and to which reference will be continually being made. In the case of accounts, it may help to overcome geographical problems within the building. Both book and periodical acquisitions departments need ready access to the accounts section: the former in part because of the volume of invoices passing through, but also for checking on whether payments have in fact been made; the latter because of the need to check, when querying the non-receipt of an item, that the subscription has in fact been paid. (In a library in which book selection is carried out by subject librarians they too will require access to the budgeting information, although this can be achieved by their visiting the accounts office from time to time.) Unless both book and periodical acquisition departments are adjacent, the potential to put a terminal in each — if the computer system will stand it — can be a large bonus. It can also have some advantages in enabling some of the routine entry work to be done by staff in those two departments, perhaps on a lower grading than the accounts assistant, who can in turn spend more time assisting with financial control and less on the routine entering of ledgers. The viability of this depends on whether the accounts computer can support a multiplicity of terminals, and on whether, if it is a separate system from the main processing systems, it makes economic sense for staff to move from terminal to terminal.

References

2. See for example Booth, John 'The 8000 network system and the 8010 professional work station'. ASLIB Proceedings 35 (1) January 1983. 15-18.
Acquisitions is a good place to start consideration of computerization of library processes, not only because it is the first of these operations, but also because it is an area in which it can be clearly seen that computers cannot wholly automate the process. P G Peacock has written:

The capacity of a computer to generate chasers automatically may be a mixed blessing if it exceeds the capacity of booksellers to respond to them; and the most voluminous of management information is of no avail if incorrect deductions are made from it. Indeed the success of an acquisitions department depends in large measure on the skill and experience of its staff, their knowledge of the book trade, their persistence in tracing out-of-print items and their promptness snapping up bargains or long-sought rarities.  

Whatever is done by way of computerization in any aspect of librarianship, librarians are still required to make it work; part of the purpose of automation is to free professional librarians from clerical operations to use their professional skills to the full.

It must be recognized that not all manual systems are ‘breaking down’ or inefficient in their use of entries. In UMIST, for example, the order card written out by the subject librarian becomes the library’s order record until the cataloguing process is completed, when it is filed as the
stock/shelf register. The actual order is typed from it. However, this two-stage process can be avoided only by a change in *procedure*, not a change from manual to a computer system; for although a computer record may produce an order from a record which remains the basic library record, this will still normally be keyboarded by someone other than the subject librarian — often because of the need for orders to pass through a single person for allocation to supplier as much as to save the time of a subject librarian who is not a fast keyboarder. Even if the system has been so refined that subject librarians key in their own orders, they are likely to have scribbled the details on a piece of paper first — orders will, after all, have come from a number of sources, and may have been checked in a number of bibliographies. It is a mistake to assume that a single entry on the computer can cope with *everything*; or to discount as a stage in the order process a subject librarian’s list made for bibliographical checking simply because it is ultimately discarded.

For the bulk of books ordered, therefore, which are received without problems, it is unlikely that a computerized acquisitions system in isolation will show significant savings in staff time. In a later chapter I have considered in more detail the matter of integration, and the progress of a single record through a number of processes; this is clearly a different matter. There will also be savings in the acquisitions area in those cases where reminders or enquiries have to be sent, which could otherwise involve re-typing the relevant details. However, if any real benefit is to be found from automating an acquisitions system, it must be sought elsewhere than in the production of notices.

The primary benefit is likely to be, as so often, in records management. Given a free hand, an acquisitions department would like to have access to its records by order number, by supplier, by date of order and by department placing the order as well as bibliographically. For the avoidance of unwanted duplication of orders the larger the number of bibliographic access points the better. While multi-part stationery could cope with the production of the requisite number of records, the maintenance of at least four separate files is extravagant of staff time. Where there are booksellers’
reports, they must either be entered four times or entered in the 'main file' to which the other files then become indexes, with the associated problems of double consultation. For each book that arrives, four records have ultimately to be withdrawn. Not surprisingly, few libraries can manage the maintenance of so many files which will probably be consulted in only a minority of cases. The first to go is usually the file by date, and the chasing of unfulfilled orders then becomes a matter of searching a large file and checking each card, or attempting a system of colour- or position-coded tags. If the supplier file has also been abandoned, either the results of such a check have to be sorted by supplier, or separate queries about individual books are sent to a supplier — sometimes in separate postal batches, increasing postal costs unnecessarily. In many libraries with large numbers of orders and reduced staffing the chasing of unfulfilled orders has become a 'hit-and-miss' process based on staff happening to notice an outstanding item, or queries from teaching staff or readers as to the likelihood of a book's arrival. Even the maintenance of a single file may prove very time-consuming if the file is of any size. This is an indispensable part of the operation, and one where a computer can give considerable assistance.

The computer system must therefore be able to access its records by any of the above keys, and to produce lists selected by one or more of such keys and sorted by others. Such listings may be run as batch programs. Other listings which would be useful spring to mind, such as lists of booksellers' reports sorted by ordering department for reporting on progress to academic staff. Notification to the recommender of a book that it has arrived can be done as an automatic part of the accessions system, but is timetaking to do manually if it can be managed at all. These are areas in which the service offered from a computerized system can be shown to be an improvement on a former manual system, rather than effecting actual savings in staff time.

The question of bibliographic access is an important one. Space is saved in a large computer file if the index is of fixed length, and for this reason records are often indexed by ISBN, ISSN, LC or BNB number. Most systems require a
record to have an individual number for control within the system, and if one of the above is not available — either because it is not known or because it does not exist — a local number is usually assigned. However, if this were the only access to the record some form of hard copy bibliographic key would need to be provided, whether in the form of a manual file or output — print or fiche — from the computer. Production of a large, ordered computer file can be expensive, and is therefore likely to be infrequent; this may be adequate to cope with queries arising on books known to be on order, but may institute an unacceptable delay in the checking of whether a new order duplicates one already in the system. Naturally access to the files bibliographically, preferably on-line, is better. It will also be better the wider the access possibilities are. It is a well-known fact that not all orders, or subsequent enquiries, are bibliographically absolutely accurate — they quote second authors, or editors where under AACR2 the ‘main’ entry would be under title. It does not always make sense for all orders or any enquiries to start with a complete check of bibliographic details in publishing bibliographies, and therefore a balance must be struck between the provision of suitable access points and the costs of so doing. This question is of even more relevance to the library catalogue, and therefore is explored in greater detail in chapter five.

One point relevant to this question which needs to be considered in designing an acquisitions system is whether or not it should be MARC based.² The advantages of MARC are the ability to acquire records produced by other libraries — in which case savings can be made on the keyboarding element — and the possibilities for its use in direct ordering, a subject discussed below. The possible introduction of the United Kingdom Library Database System as a large database of potential requirements in MARC format may influence decisions in this area. If an acquisitions system is part of an integrated library system the needs of the cataloguing section may also be relevant. The disadvantages of using MARC within a local system are that where records need to be created locally staff need to be familiar with the coding structure of a MARC record, and that this structure (which
affects the filing of a record) provides an additional level of error which may affect the chances of retrieval and thus the degree of duplicate ordering. In addition, MARC records acquired from outside the library may contain information which is not required, and which will affect storage requirements and quite possibly sorting times; the number of variable-length fields will either greatly increase search time or require the construction of a separate index, preferably with fixed field lengths. It may be possible to keep output parameters fairly simple, but they will still need to take into account a number of possible fields in which the relevant information may be found.

It is possible to accept MARC records into a system which nevertheless does not use the structure internally. Many commercial systems — GEAC and URICA for example — adopt this practice. This makes it possible to use records from central agencies such as the Library of Congress or the British Library, without the system problems mentioned above. However, without an exchange format such as MARC it is not practicable to transfer records out of the system except, possibly, to another library using identical programs. Thus libraries in this situation will be unable to act as contributors to the proposed UKLDS (and will therefore find it more expensive to use); they would be unable to take full advantage of membership of a co-operative; and they could find that their ability to transmit orders directly to book-sellers is severely impaired.

A system which is not even MARC compatible has little likelihood of having a machine interface with the outside world in either direction; that is, all records will have to be created locally, as well as transmitted to suppliers on paper via the postal system. Against this must be set the potential for keeping records simple (by not worrying about the difference between a personal and a corporate author, or an author and an editor, for example), and therefore for providing prompts for the keyboader. (This latter is just about possible with a MARC based system, but only if the sophistication of the coding structure is ignored, and if the prompts are backed by a fairly complex program of interpretation.) It may be possible to settle on an average length for authors
or titles, and by accepting a certain amount of truncation in some cases and some blank spaces in others to produce a fixed-field format which will speed the searching of the files. These in turn will be shorter because the record length will be less than in the case of a MARC record, thus reducing storage and processing costs. Output parameters for producing orders and listings will probably be simpler.

What weight is given to these relative advantages and disadvantages will be affected by a number of considerations. The overriding one will probably be whether the capacity for handling the size and structure of files required by a MARC based system exists, or can be afforded. Closely related is the question of whether the MARC structure is required for another part of the processing system, since the potential future integration of the systems may indicate the use of MARC structure even if the two systems run separately for the present. (This question also is treated more fully in considering integration in general.) Equally, if MARC records are used elsewhere in the system the capacity for handling them presumably exists, and can probably be extended. If the acquisitions system is considered in isolation, the likelihood of obtaining a MARC record at the appropriate time — and with the appropriate information — becomes a vital factor. If the main tool used for book selection is BNB, this is not likely to provide a problem — some sort of record will be available for all BNB items. Libraries which order well in advance and from publishers’ information may well find difficulties; even CIP records may not be available. The Bath Centre for Catalogue Research is currently carrying out a study into the currency of UK MARC records, and the British Library is intending to re-direct its efforts towards CIP. One future development which could affect this is the possible appearance of the Whitaker file (from which British books in print is produced) in MARC or MARC-compatible format on BLAISE — this would provide a more current record than CIP, particularly in regard to price information. This latter point is naturally very important to an acquisitions system, whereas the completeness of the bibliographic record may be less so. The actual format of the Whitaker file will be a further important factor, since unless it provides a
reasonably-coded basic record its potential usefulness will be reduced. (Nor would a straight reproduction of the inverted titles of British books in print be welcome.)

MARC records for foreign material are not easily obtained, particularly at the ordering stage. At present there are no exchange records available from European countries, even those which, like Germany, are beginning to produce them centrally. Libraries which order a large quantity of foreign material are therefore dependent largely upon the LC MARC tapes for such of this material as has been catalogued by the Library of Congress, and upon any co-operative to which they may belong for the rest. In neither case are records likely to be available until some time after publication, unless the book is available significantly later in Britain than in the United States. Access to such records will frequently need to be by bibliographic description because of the lack of an ISBN at the time of recommendation if not on the book as well. As I have already mentioned, the problems of bibliographic access are considered in the chapter on information retrieval.

One further consideration may affect the choice of whether or not to use MARC format records, namely the ability to manipulate, and the cost of manipulating, a MARC record to produce the sort of listings referred to at the beginning of the chapter. Details such as bookseller, order number, ordering department may well be buried in a MARC record; within SWALCAP, for example, the recommended field for the above is 950, each element of the order data being held in a separate sub-field. The retrieval of records by this information may involve a considerable programming effort and a great deal of machine time. In particular the recording of a sequence of booksellers' reports may prove cumbersome, and ensuring that reminders are not sent if a report has recently been received may be problematic. The MARC format was designed for the exchange, rather than the control, of bibliographic data, and is therefore not ideally suited to an ordering process. This is an area in which a locally-produced, minimum-entry fixed-field system may show distinct advantages.

As to the question of whether or not the system should be
on-line or whether the necessary operations can be performed in batch mode, the ruling factor here is less the needs of the ordering process as such than of the consultation and enquiry function, used both for queries from suppliers and recommenders as to orders in process and for checking the on-order file at the stage of book selection. For book selection, an on-line file is always likely to be preferable, as being up-to-date, but perhaps less obviously this becomes more important the larger the file size. This is a simple matter of economics; the larger the file, the less frequently it can be re-sorted to accommodate additions, meaning that it is either out-of-date or (usually) is supplemented by something. If supplements are used, the problem of checking becomes acute; at one time, under Manchester University’s former off-line ordering system, it was necessary to check the main listing, the cumulative listing for 1-3 months, and a weekly cumulative listing — the temptation to delay orders until the next main listing was run was considerable. An on-line system only requires a single consultation, although it may involve problems of constructing a search acronym! A possible compromise with a large file and limited on-line storage is an infrequent cumulation (quarterly?) with on-line access to only those records not incorporated, thus limiting the number of look-ups to two. However, in an average-size library such as Reading University, this could still result in an on-line file of over 5,000 records.

The joker in the pack of almost any ordering system is the standing order. I do not include orders for serials in this category, since for the most part they lead to regular publications and become active at least once a year. I am thinking here of those orders for works which will (one day) be complete in 75 volumes, but meanwhile are being produced in fascicules, some years five, some years none. They present problems because they can so seldom be cleared from the file, and because it is difficult to send a reminder to a publisher when no expected date of publication is given. Equally, because they can go on for years, both booksellers and librarians can forget their existence, and fail to send or claim volumes to which they refer. A further category, even more problematic, is the standing order for a monograph
series, which will be entered — can only be entered — under the series title. The monographs to which it applies will doubtless all be announced in pre-publication publicity with only the briefest mention, if any, of the series, and this will usually not be mentioned at all on the book recommendation. Duplicates may therefore be ordered under author and title.

To this sort of problem the computer has no real answer. It may assist in keeping a list of extant standing orders, and enable the output at the end of a year of a listing of all those against which nothing has been received, for checking against appropriate publishers' catalogues. The actual spotting of relevant items will still need to be done manually, and the identification of duplicates may well not happen until the cataloguing stage — although if the accessioning process is tied in with cataloguing they may be caught at a stage where their return is more feasible. The only area in which computerization may be of assistance is for obtaining a full record for a book at the order stage which will contain details of series and may jog the memory of acquisitions staff.

One further question needs to be considered, the form of output from the system. The content of the output is fairly standard — all the basic bibliographic elements which are known. The layout of a proper order may also be straightforward, although the formatting program needs to be written so that the resulting order can be folded and placed in a window envelope to avoid further clerical effort. Even with conventional paper output, however, a decision needs to be made on whether the stationery is to be of a size for a single item per order, or for multiple items (with a waste of paper if only a single item is required). The latter arrangement — the usual system for manual systems — has system design implications also, since each item on an order must be capable of being uniquely identified in the system (not all items on an order arrive simultaneously). The former method is more common in computer systems, and may be necessary for computerized accounts systems, but where orders are being sent to the usual supplier it may result in quite a large (and expensive to post) package of orders to that supplier, much of which in effect consists of repetition of the library's address, the supplier's address, and details of how to send the invoices.
One method of avoiding this problem is the transmission of orders via telephone or data lines direct from the library computer to the bookseller’s. There is a commercial system called ‘Teleordering’ which is already in use between booksellers and publishers, and is covering at present about 20% of the home market. The system is being extended to allow for ‘dial-up’ connections from portable terminals or to use the PRESTEL system, but for library purposes the connection from a microcomputer is the most useful. The system developed by Blackwells, BOOKLINE, is currently on offer to libraries, although with costs ranging from £14,000 to £50,000 depending on the level of the package offered it is clearly a major investment.

Although Blackwells stress that their package is not intended to bind a library to a single supplier, it is obvious that until such systems become common in all bookshops they are going to limit the librarian’s choice of supplier for the more common books in practice if not in theory – there is no point in investing that sort of money and not using the facilities it offers. This may clash with official policy on the number of suppliers to be used. In many cases it is not ultimately in the best interests of the library or its users; this is particularly so if the orders are directed away from the local area to a major distributor, when locally-placed orders might assist in sustaining a bookshop in the area. There is also the worry that order data may for some reason fail in transmission, or result in the wrong item being sent – a fear that is more felt than substantiated by experience, although systems based on the use of ISBNs, particularly if they lack on-line confirmation of titles, can result in muddles either from unnoticed changes of ISBN or from confusion of paperback and hard-cover numbers. Geoff Ford, in a recent seminar on ‘Automation in the bookshop’, pointed out that the high cost of telecommunications may offset other savings to be made, and that the increased speed of processing the order may not result in faster supply where the order is placed prior to publication.

A final point needs to be made about acquisitions systems, although again it is applicable to all areas of library computerization referred to in this book. A computer system
will not be foolproof. I can remember finding (by accident) an item listed in the Manchester system under the author MQRX, KQLR. The computer cannot be blamed for this, although it is true that manual filing would have spotted the error and corrected it. But no system, computer or manual, is totally free from such problems — failure to distinguish Norman and Normann as surnames, two cards turned over together, different titles at different stages of pre-publication all leading to duplicate ordering. The problems of a computer system will be different, but not necessarily worse. Doubtless in any system constant checking and re-checking could weed out virtually all the errors, but as in other areas of librarianship, and of business and industry, the effort required is disproportionate to the savings to be made. Pleasant though it might be to be certain of buying no unwanted duplicate copies, if the cost of this is a reduction in the total number of orders processed it is unlikely to be beneficial to the library’s users.

Serials

The proportion of time taken in ordering serials (or even cataloguing them) is small compared to the time taken dealing with the receipt of the individual parts. As far as computerized acquisition of serial publications is concerned, therefore, it is scarcely worth considering if it cannot in some way assist this daily routine. (Naturally, if a book ordering system exists initial orders for serials can be placed through it.)

At first sight, the recording of serials’ arrival should be a highly suitable task for automation. It is a routine operation, there is a constant need for warnings of parts not supplied, and only in a limited number of cases do the sort of queries arise which require study of the material combined with inspired guesswork to solve. (Examples are when a periodical changes its title without warning, or elects to change its numbering or split into sub-sequences.) However, the very regularity of the operation, combined with the high volume of the workload in most libraries, has led to the establishment of very efficient systems of manual records. The most common of these is of course the visible index, cards on
which the receipt of each part can be recorded in the briefest detail, and on which provision is made for the recording of all other relevant information—order details, invoice payments, binding instructions and record of sending to binding. In addition most systems use colour- and position-coded indicators to record either the month/week of last arrival or of expected next arrival, and the scannability enables anomalies in receipt to be rapidly noticed.

There is a danger, therefore, that computerizing the receipt of a journal could increase the time taken to record its arrival. Some sort of identifier has to be keyed in, and the only one which can be assumed to be on every journal is its title. Since many of these are quite long (e.g. Transactions of the Institution of Mining and Metallurgy, Section B: Applied earth science), it will take longer to key this in than to find it on a visible index; it must therefore be abbreviated according to a straightforward procedure, which may lead to a list of titles with similar abbreviations. From this list a selection will have to be made, which will involve a second stage of operation. Alternative keys can be used, such as ISSN or CODEN. The use of these is, however, not universal, although where they do exist there is less likely to be confusion than with ISBNs. Some periodicals now bear their ISSN on the cover in bar-coded format, and in conjunction with a suitable reader this could indeed speed the check-in process. No library system based on this has yet been reported.

Savings can be made on the next step if the system responds with details of the expected part, which will be the item received in most cases, and which can then be reported as received with a single keystroke. Correspondingly, however, where the part to hand is not the part expected—a part has gone missing, or a back issue has arrived—the situation may take longer to deal with on a computer than manually. There is also a greater danger of an assistant recording such a part erroneously as the expected part; at least in a manual system it is normally necessary to look at the number on the front cover to see what to write. Moreover, in this sort of operation the response time of the computer can become critical, since waiting while it searches large files will adversely affect the overall performance; thus with any size of serials operation
large enough to merit computerization a reasonably large processor is required, either locally or at a remote site. Blackwell's PERLINE makes the claim that it can reduce the check-in time, but only by a small amount. It is questionable whether this sort of saving alone could justify the capital expenditure required on a computer system.

Such a system will, however, have 'spin-off' benefits. Access to the records from other areas of the library may be one, very useful if enquiries are made at a subject desk or enquiry desk remote from the periodicals department. Automated indication of failure to supply may be more accurate than use of a visible index, especially when a small staff is hard-pressed. It may be possible to include in a computer record more details than fit comfortably on the front of an index card — details of what to do with the newly-arrived item in the way of circulation or SDI services, for example. The possibility of a direct interface with the accounting system has also been mentioned, and is explored further in the context of integrated systems.

If the system involves a printer, it may be possible to produce circulation slips for an SDI system or binding instructions as part of the check-in operation. However, it would be dangerous to get too carried away with this sort of possibility. If the check-in assistant has to wait while the slip is produced, it will slow the registration of new parts considerably. On the other hand, if the printing is carried on simultaneously with the checking-in of other titles, the slips must subsequently be associated with the correct items — which will take time and may be a source of potential error. A pre-printed slip in the visible index may prove to have time advantages over a computer system. Nevertheless, it should be noted that the only operation of any real size to use PERLINE — UKAEA at Risley — has reported very favourably on staff savings which it made possible.9

The biggest extra benefit of computerization is probably the production of a list of current periodicals, together with information about holdings. In many libraries such a list used to be produced annually; then it became less frequent, perhaps every five years. Now it has been dropped altogether in a number of libraries, and the new generation of lists is
being produced on computers instead. In this form they can be produced reasonably cheaply at much more frequent intervals, and with a variety of access points. At this point the problems become those of catalogue output, and are considered in the chapter on information retrieval.

However, in addition to the internal listing, and the possible offshoot of on-line access by readers requiring up-to-date information on the holdings of a journal, a machine-readable list has considerable potential in producing union lists within a locality (at least as long as the products of various computing systems can be made compatible). The North Western area list was a good example of a manual list, and work is in progress on a computerized updated list for Manchester and Salford Universities, UMIST, Manchester Polytechnic and Manchester City Libraries. Such union lists assist greatly in helping readers as there is a chance that they will actually be able to go to a holding library. They can also help in making decisions about purchase of new titles — when money is short the knowledge that a title is taken locally may be important.

The value of the management information which can be gathered will be to a large extent dependent on the detailed design of the system. It would always be helpful in planning optimum use of staff, holiday arrangements, or suitable times for onslaughts on background work, to have some detailed picture of the pattern of serials arrival. This can be collected manually over a short period; a computer will require a calendar to produce satisfactory data. It is unlikely therefore that a system run wholly on a microcomputer will be able to help in this respect. The simple gathering of numbers of parts received, while it can be fitted into a case for the preservation of staffing levels, is otherwise of little real interest. The whole question of statistics is discussed in chapter eleven, since there is a temptation to acquire all the statistics a computer can produce, irrespective of their relevance or cost.

A computerized check-in system which is linked to other libraries has certain possibilities not available to a stand-alone system. As yet, none of the library co-operatives has moved into this area, and it is unlikely to be high on their list of priorities. Blackwells have introduced their system PERLINE;
this has network facilities in that users may use it to communicate with each other via the centre; it also enables information from a number of users to be correlated at the centre. Thus a claim for a missing part may be triggered when it is known that the issue in question has been received by another library, and has therefore been published — enabling much earlier (and therefore more successful) claim generation than waiting for a subsequent part to arrive, without too great a risk of claim and part crossing in the post. The local software associated with PERLINE, PEARL, which runs on a microcomputer in the library, enables all the normal functions of a serials department to be carried out locally, while the connection to the central database ensures that information on frequency, price and publisher is constantly updated. Facilities are available for electronic mail between Blackwells and the customer. PEARL also supports an accounts package. The use of PERLINE to date, however, has scarcely been sufficient for its potential to be objectively evaluated.

Document delivery

A chapter on the acquisition of materials cannot conclude without mention of automated document delivery, although this is as yet in its infancy. It relates particularly to serials, since it is of use primarily for material of limited length. There is no working system in Britain, although it is hoped that Project Hermes, an experimental system, will get under way in 1984. The basis will be a database of documents which can be accessed from remote terminals and transmitted via telecommunications links to printers at those terminals. Supply of anything available on the database will thus be very swift, although differential telecommunications charges will make overnight supply more attractive than simple on-line provision. Charges will be made for the material as well as the communications. Initially the system will only cater for straightforward text in Roman type, although extensions to cover diagrams are planned. More ambitious in this respect, although less close to implementation, is the ADONIS project, under discussion by a consortium
of publishers.\textsuperscript{11} This would involve facsimile transmission of
text by digital techniques, which will enable transmission of
diagrams and even half-tone or similar illustrations. Both
systems may, if the experiments are successful, enable an
acquisitions system to be as responsive to reader demand as
an inter-library loans system is at present. This would revolu-
tionize serials acquisition if sufficient titles were available in
this fashion, since there would no longer be any need to keep
track of missing parts — each required article would be
requested and logged on arrival like a book. There are, how-
ever, problems — legal and financial as well as technical —
which may delay any widespread application of this.\textsuperscript{12}

Inter-library loans is itself an area in which automation has
a part to play. The major scheme in this area is of course that
pioneered by LASER (the London and South Eastern Library
Region) which gives member libraries on-line access to the
union catalogue.\textsuperscript{13} It is interesting to note that out of this has
grown the use of the database for cataloguing purposes, while
as yet none of the cataloguing co-operatives in the United
Kingdom has developed into an inter-lending resource. OCLC
Inc does fulfil this function in the USA, and the difference
may well relate to the existence of the very efficient service
based on the regional bureaux and the British Library Lending
Division. Academic libraries in particular use BLLD as their
first resort for inter-library loans, and the recent decision to
put the union catalogue of foreign publications into machine-
readable form, and to make this available on-line either
through UKLDS or direct,\textsuperscript{14} will doubtless facilitate the use
of this centralized system. It will therefore provide an
incentive for academic libraries, and perhaps the larger public
libraries, to have computer terminals or microcomputers in
their inter-library loans departments. If these can be used
not just to search the union catalogue but also to place the
request, their benefit will be even more apparent.

There are other benefits to be reaped from automation,
or partial automation, of the inter-lending service. These
include some features such as possible linkage to the circula-
tion system for obtaining readers’ names and addresses and
controlling the loan of books from other libraries. The most
valuable feature in terms of provision of a library service,
however, must be the ability to analyse the inter-library loans in various ways. From such analysis can come information as to which libraries are quickest in satisfying requests, and which areas of the institution make most use of the service. This can lead to altered patterns of purchase to make better provision in some subject areas; periodical titles can also be analysed to discover whether in any cases it would have been cheaper to purchase the entire journal than to make ILL requests. However, in this area as in all others it is important to ensure that computerization does not equal complication, and that the system does not become so computer-dependent that no information can be given to readers when the machine is down — a point very clearly emphasized in the operation at York University.\textsuperscript{15}

Finally there remains the whole vast question of electronic publishing and its implications for libraries. At present, these must be largely speculative, since the subject is full of unknowns and unknowables. So far the fullest treatment has been in discussion documents given limited circulation for comment.\textsuperscript{16} A number of aspects have recently been covered in a paper by John Gurnsey.\textsuperscript{17} One possibility is that libraries will for some material end up simply as distribution centres, probably with high-quality printing equipment; they may even be bypassed in a number of cases by end-users making direct access to the databases. An alternative proposition sees these databases copied (probably on optical disks) and sold to libraries, who then continue to fulfil their conventional role although with rather different equipment. In either case developments in this field, about which the only question seems to be the speed, are likely to affect acquisitions \textit{policies} rather than \textit{procedures}; in the second case suggested, for example, there will still be a need to ensure that the latest update on disk has actually arrived. Some would see the library becoming a \textit{creator} of databases, and a means of access to an even wider range of information than is usual at present.\textsuperscript{18} If this is so, it will effectively broaden acquisitions policies; it certainly does not suggest the disappearance of the library or its operations.
References


2. The basic concept and structure of the MARC record is discussed by Ellen Gredley MARC: an introduction (Polytechnic of North London School of Librarianship and Information Studies Occasional Publication No 4), 1983.


6. 'Automation in the bookshop’, a workshop organized by Professor A J Meadows on behalf of the Primary Communications Research Centre and held at the Institution of Mechanical Engineers, 28 June 1983. Reported in MARC Users' Group Newsletter, 83 (2) July 1983. 11-17.


8. MARC Users' Group Newsletter 83 (2) July 1983. 16-17.


11. Outlook on research libraries 3 (4) April 1981. 2.

12. See the report of the ASLIB one-day conference on 'new approaches to document delivery: systems, services and their implications'. ASLIB Proceedings 35 (4) April 1983.


4

Book circulation

Any librarian who has worked as a junior at a circulation desk will know that a high proportion of the work is filing or retrieval — tasks for which computers are very suitable. The temptation is that a library will leap straight into the idea of using computers without full consideration of either the attendant problems or the potential extra benefits; indeed, the number of libraries using automated circulation systems must give rise to suspicion of this.\(^1\) The approach adopted by the Polytechnic of the South Bank provides a useful example. They began by listing the problems that existed with the manual issue, the general problems related to their whole system, and the management information that was desirable. This then formed the basis for discussions with potential suppliers and evaluation of potential systems.\(^2\)

The main attendant problem is that jobs other than the actual filing and retrieval may be made more difficult. For example, the simplest system — in computer terms — is one which associates a book number with a borrower number for the time the loan is outstanding, reports on loans which are overdue, and traps on return those books required for other readers. The computer advantage is that its records consist of two fixed fields, which make file handling relatively simple. The extra library work arises from the need to find the book number before making reservations, and to translate book
and borrower numbers into usable details when sending recalls or overdues. The problem is increased if library policy dictates the trapping of all copies, with the consequent need to look up the number of each copy and to remove unwanted traps when the reservation has been satisfied. Reading University Library used until recently an early, off-line ALS system which was number based, although it did have a borrower file from which the computer extracted details of the name and address of the borrower. Overdues could thus be sent, but all they contained was a list of book numbers. If readers wished to know the authors and titles to which these numbers referred, staff had to look them up on the microfiche version of the accessions register. At the time of the annual recall of books, there were normally two members of staff engaged almost full-time on this operation.

This problem can be avoided if the system holds a back-up file of book records, as well as borrower records. Unless the complete loan details are accessible by a bibliographic key to the back-up file, the problem of checking that a book is on loan still remains — it is necessary to consult the catalogue record to obtain the circulation system number. In addition, a file of book details is a much larger file than a borrower file, and usually undergoes a greater number of changes. (This is more marked in academic libraries, where the additions to, and deletions from, the borrower file happen largely over the summer period, while books are being constantly added.) By the very nature of a library’s bookstock, a file containing entries for the whole stock will, in all but the smallest branch libraries, contain a large number of redundant or near-redundant entries for stock which is seldom or never borrowed. The vast majority of the remaining stock, although heavily used, will not be subject to recall or overdue notices, particularly in a public library where annual recalls and stocktaking do not take place, and it may be questionable whether the benefits outweigh the storage costs, more complex programs, and increased processing time, not to mention the vast amount of staff time involved in the creation of the file initially. It should be noted that in some form or other borrower records will need to be created in any system; putting them on the computer involves staff only
in extra keyboarding. Book records already exist in the form of the catalogue, and the creation of a new file of these would need to be justified in cost-beneficial terms.

The existence of such a file can, of course, serve other purposes, which may help to justify it. It may serve as a short-entry finding list, perhaps with some rotation of the elements in the record to allow titles to be included as access points, and the classified sequences to be produced. This requires a computer with the processing capacity to handle such sorting of a large file, and involves a choice of output medium similar to the choice for catalogues. This has been discussed fully under that heading; suffice it to note here that printed output is likely to be cumbersome and expensive, while COM requires the provision of equipment and the use of bureau arrangements. Both presuppose a formatting program for the records. At this point it is important to be clear as to the purpose of this file. If it is really intended to be a short-title catalogue, then it requires access points in much the same numbers as a full catalogue; it certainly needs access via second and third authors, editors, and title, and perhaps by additional subject entries. Without these, it is at best a finding list for people who know what book they want and are fairly clear that it is in the library. To produce this sort of short entry catalogue requires a sophisticated program and cataloguing input, and makes sense only if it is either a subset of the main catalogue or is in itself the main library catalogue. (The use of short entry catalogues has been discussed in chapter five.) This naturally leads to the question of integrating the computerization of different areas of the library — as it did in the case of the Polytechnic of the South Bank — a subject which is looked at in more detail in chapter seven.

This is, however, overkill as far as a circulation system alone is concerned. Here the title file is primarily a back-up intended to give sufficient details to enable a reader to identify a book recalled or overdue. Confusion often arises when the circulation system allows the file to be accessed on-line by some form of bibliographic description. This is a useful feature which avoids the need referred to above for consultation of the catalogue to precede an enquiry as to the
whereabouts of a book. It has the advantage as well that it may be possible to inspect the position of all copies simultaneously, whereas an enquiry by number may involve a separate enquiry for each copy. It is at this point that a conscientious reader services librarian may wish users to be able to access a book by any known part of the bibliographic description; while an enthusiastic librarian may run away with the idea that this file represents an on-line catalogue, as opposed to the card or COM format of the main catalogue. This sort of conflict is best considered with other aspects of producing integrated systems, but the danger must be noted for those contemplating a circulation system.

By the time one is contemplating on-line access to circulation records through bibliographic descriptions in any form one is, for reasons of file size and processing capacity, moving away from the possibility of a microcomputer-based system. One has also, in the normal swings and roundabouts way of computer systems, increased the difficulties of creating the backup file. If all that is wanted is an identification of a book on loan, it does not matter if one copy is entered as 'Samuelson: Economics', another as 'Economics, by Samuelson', and a third as 'Samuelson's Economics': the reader should in all cases be able to identify the appropriate book among those propping up his table leg. If the aim is to associate all copies so that access by bibliographic description can lead to loan details of them, this description will normally have to be the same; exactly the same, in most cases, since the machine is comparing two strings of characters, not meaningful words. This presupposes a degree of checking of the entries and monitoring for consistency, rather than a number of staff 'doing their best' with minimal input data. Experiences at Reading showed that even with fairly firm guidelines for entries, and with the facility for copying entries exactly to another number, there was about a 5% error rate of entries with marginal differences. (This was in addition to the less traceable differences resulting from direct input of some books under editor as if author, and records for later copies transferred from the cataloguing system with title entries following AACR2.) The problems are minimized if structured records are avoided and free text searching used.
An alternative method is to link like entries in the system, so that a reader reaching one by whatever route would automatically be offered the others. This system was used by Manchester University Library,\(^3\) essentially for the management of their reservations system. It has advantages in not requiring exactly similar entries and in enabling the linkage of books essentially the same but without exactly matching titles (*Henry VIII* and *King Henry VIII*, for example). Its disadvantages lie in the fact that all links have initially to be formed manually and in the complexity of the program required to operate this system. A variant was used in Derbyshire County Library, in which the ALS number allocated to a book was linked to the ISBN or local equivalent, which formed the link with other copies and with the bibliographic backup.\(^4\) This works in a library where the majority of the stock has an ISBN; an academic library with a great deal of early and foreign material might have problems in control of local quasi-ISBN allocation.

Another issue in which a decision must be made at a fairly early stage relates to the method of data capture. The data to be captured, whether from reader tickets or books, is virtually certain to be a number, and certain to be a fixed field of no more than about ten characters. It is equally unlikely that a library will wish the normal method of data capture to involve the keying in of all digits, even if the existence of a check digit decreases the possibility of error. (Check digits are not always very reliable; it depends on the way the weightings are arranged. SWALCAP's check digit is calculated in such a way that the reversal of the final weighted digit and the check digit — a very easy and common error — produces a *valid* number. This is something for others to avoid.) There are four methods of data capture which can be used: punched cards, magnetically-read cards, optical character recognition and bar-codes.

Punched cards are straightforward, and were very common in early systems. They have now almost dropped out of use. One disadvantage lies in the degree to which the cards wear, with the possibility of misreads as the holes get worn; but more significant is the fact that each requires a book-pocket to be fixed to the book (extra time and expense in book
preparation) and needs the card to be removed from this pocket, placed in a reader (which has to be pushed down or forward) and then removed and replaced in the pocket—a timetaking operation for issue or return. Finally, because the cards cannot be fixed in the book, they fall out and get lost—a nuisance—or are replaced by well-meaning readers (or less well-meaning ones!) in the pocket of the wrong book—the beginnings of chaos. They have to be bought in bulk sequences, and local production of replacement cards is an inconvenient process involving a hammer and a punch, or at best a manual keypunch.

Self-adhesive magnetically machine-readable labels are naturally preferable to the loose book labels; they cannot fall out or be changed from book to book, and they can be read more rapidly. The normal system is to rest the book on an angled piece of desk in which the reading equipment is fixed, so that the process of reading consists of sliding the book along as it is date-stamped. This system can be made to work in conjunction with magnetic systems of theft prevention—the ALS system can be united with SENELCO—so that a book properly issued is automatically freed to leave the library. The disadvantage of this sort of data capture is that the label must be fixed in a certain position, and must usually be on the back cover or back fly leaf of the book. This means increased care in book preparation, and also provides problems when the end papers contain information—tables or maps—which should not be obscured. Again local production or replacement presents problems. Both magnetic labels and punched cards suffer from the lack of portability of the reading equipment, coupled with the difficulty of installing it in a number of different offices.

Optical character recognition (OCR) and bar codes can be treated together. Both require a special self-adhesive label which can be produced locally or bought in batches. OCR has the advantage of not requiring a separate eye-readable legend; local production can make use of a suitable IBM golfball or appropriate daisy-wheel on a word processor as well as a dot matrix printer. Bar codes do require translation into intelligible characters, and can normally only be produced on a dot matrix printer or similar equipment. They also need
to be slightly larger than OCR labels in height. The flexibility of production of OCR labels is tempered by the availability of IBM typewriters and the need to calculate a check-digit before creating the label; for labels of both types produced on a printer attached to the computer system this calculation may be performed as part of the printing operation. Either type of label can be placed anywhere in a book, the primary limitation being the ease with which an assistant at the issue desk can find it. Certain other points, such as the trimming of margins and possible discard of flysheets during binding or re-binding operations, must also be considered. Both are read by a hand-held reader. That for the OCR system at Newcastle University Library resembles a miniature hair-dryer, while bar-codes are usually read by a light-pen resembling a fat biro. It is perhaps fair to say that staff have slightly more difficulty adapting to the use of light-pens than to the OCR readers, although the proportion of misreads seems to be higher with OCR systems.

Whichever system of data capture is used, equipping the existing stock of a library of any size is sure to be a problem. The fundamental question is whether the number is to relate to any number already in use, or whether it is to be assigned on a purely arbitrary basis. The latter system enables labels, cards or whatever to be purchased in long sequences from a commercial supplier; in the case of punched cards or magnetic reading labels this may be the only convenient method of supply, while for OCR and bar-coded labels it may mean a higher quality of output with easier reading as a corollary. However, it does necessitate the association of a bibliographic record with the number at the time of its assignment to a book, which can be done simply either by relating the circulation number to an ISBN (as in Derbyshire), or by relating it (in a manual list in the first instance) to the accession number or to a unique shelf mark, depending on whether the accessions register or the shelf register is more usable for tracing purposes (and on whether shelf marks are unique). This sort of system requires minimum preparation, and can accommodate as many people putting labels into books as the library can afford. However, unless very great care is taken in the choice and training of labelling staff, and
subsequently by the staff employed in the keyboarding operation, it will be possible to have inaccurate accession numbers, ISBNS or shelf numbers assigned to circulation numbers. Moreover, unless and until bibliographic descriptions are added to a backup file, tracing the bibliographic details to which a circulation number refers will always be a two-stage process; the first stage of this may, of course, be carried out automatically by the computer. A variation on this system was used for a time by Manchester University Library, in which the label was assigned to an unlabelled book at the time of issue, and the same number recorded on the slip for the manual system on which the reader had written the bibliographic details. This slip was then used as the punching document to produce the appropriate entry. The difficulty encountered was the dubious accuracy of some of the details supplied by readers, and of course the variety of idiosyncratic handwriting. It did, however, mean that in a library with a very large bookstock effort was directed to that part of the stock which was actually borrowed by users, and which was therefore of the highest priority.

When Reading University Library first automated in 1964, it used an ALS system based on punched cards. Because it was known that there would never be a backup description with that system, or even an automatic relation of the circulation number to an accession number (the only unique number in the Reading system) it was thought sensible to relate the circulation number directly to the accession number; the circulation number was thus the accession number with the addition of a check digit. It was intended that all books (but not bound volumes of periodicals which are interfiled with books in the classified sequence on the shelves) would be carded for the system, with the exception of special collections. The bookstock at the time was in the region of 125,000 volumes. The shelf register is in the form of cards, and the punched issue cards were acquired as a sequence and then filed into the trays of shelf cards behind the card for the volume of that accession number. This meant a long time spent in preparation, much of it using 'dead' time when staff had to be manning a particular point but were unlikely to be very busy — but it enabled teams to work
in several places simultaneously and find the issue cards in the (approximate) order of the books on the shelves. Errors did unfortunately occur — wrong cards put into books because the shelf-order varied from that of the shelf cards, or because staff forgot to make allowance for a book out on loan, and lost their place in the sequence of cards. Not all these mistakes were noticed — errors were still being discovered when the system was changed in 1982.

The introduction of the SWALCAP on-line circulation system in 1982 involved a repeat of this exercise with bar-coded labels, and for a bookstock which had grown to over 300,000. The decision was taken to make labels locally from the accession numbers on the shelf cards. Worry about possible miskeyings and resulting errors led to a process whereby the check digits were added to the cards in one operation and the labels produced in a second operation; staff were instructed to ensure that the check digit on the label matched that on the card to spot instances where a number was miskeyed. This precaution seemed excessive, was very time-consum ing, and has not been used in the subsequent labelling of the periodicals collection; only time will tell if this economy was justified. For two smaller collections — the education library of c 50,000 volumes and the library of the National College of Food Technology (c 10,000 volumes), pre-printed bar-coded labels were purchased, and staff had to select the label of the appropriate number from the sheets in front of them. This worked well for the smaller collection, and fairly well but slowly for the larger; it is not recommended for anything beyond this size, as the bulk of the labels becomes unmanageable, and it is impossible to avoid double or triple handling of books.

In any decision as to whether and how to computerize a circulation system, consideration must be given to what other tasks the system should perform. As an over-simplified generalization, one might say that whereas a catalogue tells you whether the library has the book in stock, the circulation system tells you where it is — no indication meaning that it should be in its correct place on the shelves. Thus it must be possible to issue books to numbers representing all the various places that a book might go — to binding, to be re-
catalogued, on inter-library loan, to a department for its internal use (e.g. dictionaries in the cataloguing department) — or to indicate that it is known to be missing. However, with the facilities of a computer it should be possible to do more than this. 'Overdues' can be produced to indicate books which have spent longer than usual at the bindery and may have been misplaced; similar regimes can operate with re-cataloguing or any other such purpose. Lists of missing books could be produced at intervals for final searching and decisions as to replacement.

If the card or label with the circulation number is assigned at the time of accessioning — a logical point if it corresponds with the accession number — it is possible to keep track of a book (with or without bibliographic details available on the computer) throughout its progress from receipt to shelving. Again the overdue system can be used to prevent the more awkward books from being continually put to one side. It may be possible to allocate a number to each shelf in an awaiting cataloguing area, and thus to assist in tracing a book already arrived in the library which is the subject of a subsequent urgent request from a reader. Books which are high-priority may be subjected to a stricter regime which reports much sooner on a lack of progress. However, this can only be achieved at the cost of continually issuing and returning books; the potential advantages might not outweigh the cost in time of such an operation.

Ultimately, when bibliographic details are available for the whole stock of an area, it may be possible to perform stocktaking by using the circulation system rather than by checking each stock card against the shelves. This is most likely to be possible for bar-coded stock, for which portable readers already exist (for use largely in supermarkets or commercial storage and dispatch areas). Using this method would obviate the need to check books not found on the shelves against loan records — the computer could perform this process — and it would also eliminate the confusion which can occur when there are multiple copies of a multi-volume work (there is no chance of confusing accession numbers). The assistants undertaking the stocktaking would be freed from their preoccupation with numbers, and could
therefore give more attention to the order of the books on the shelf and to their physical condition. Assuming a suitable design of system, a list or lists of books not recorded in stocktaking and not on loan could be produced as a result, and this would form the basis for searching. It is important, if it is hoped to use a facility such as this, to design the system appropriately: it must be aware of the existence of a book which is not on loan, and it is going to save a lot of bother if all the loans to a certain number can be cancelled automatically — it removes a lot of the potential saving if each book, having been ‘issued’ for stocktaking purposes, then has to be returned. One has in fact moved out of the area of circulation systems and into stock-control systems with a much wider purpose. Again, in all but the smallest libraries (in which such a system is not worthwhile) one is talking in terms of a fairly sizeable computer system.

How sophisticated, and how flexible, a system needs to be is another very basic question which must be asked. Because a computer can keep track of numerous different facets and interrelate them, there is a danger of thinking that this must be done. It is possible to design a system which will alert staff to the fact that a reader returning books has a further book on loan which is required by another reader; or that a book he reserved is waiting for him. These are highly desirable elements — a reader in the hand is worth any number of recall notices, and many people must know the frustration of coming back from the library to find a card saying a book is now awaiting collection. These services were in fact built in to the original Manchester University system. But there is a price to pay, usually in time: if the system has to search a number of files to see what the state of this reader’s ‘account’ is, the response time is going to be slow, or even very slow. Is the extra time spent on each transaction worthwhile for the limited number in which a reportable condition will be found? It may be possible to design the system to cope efficiently with such processes, but there will then be a price in design costs; moreover, a system geared to this procedure may prove less efficient (because of its file structure) in other areas.

Other messages may not cause great delays in response, but they may lead to a regrettablly casual attitude on the part
of staff by being irrelevant. To take a case at Reading: the system indicates, on the return of a book, if a background bibliographic description does not exist. This enables books to be put aside for the creation of such a record, thus ensuring that a record exists for the stock actually in use. However, at present too high a proportion of the stock lacks such a record for it to be practicable to create one as books are returned — it would keep books out of circulation far too long. Record creation for generally heavily used areas of stock is still being done from stock cards, and until that programme is completed the ‘No description’ message is redundant. The frequent appearance of a redundant message tends to evoke an automatic press of the ‘acknowledge’ key by staff to any message; there have been cases of reserved books being returned to the shelves because the reservation message was missed. It is important to ensure as far as possible that only messages requiring some action are actually given, even though provision may be made in the design for using others later.

Some areas of flexibility may relate more to whether the system is tailor-made for a particular library, or is a commercial package, or is part of a co-operative venture. This is discussed in chapter six. It is, however, important to recognize that some types of library have greater need for flexibility than others. A public library is usually satisfied with a single standard loan period for all users and all books, with a standard allowance of books at one time. An academic library, however, is normally under pressure to allow academic staff a greater number of books than undergraduates, and for a longer period of time. Postgraduate students often form a third category with an intermediate allowance, while non-academic staff and visitors may form further groupings. A responsible librarian may wish to ensure that although academic staff may borrow most books for six weeks, or six months, they cannot do so with books for which there is a large student demand; thus there will be a need to define the loan period of certain books, as well as the definition by type of reader. In addition, an academic library may well have a short-term loan collection from which books may be borrowed for a number of hours, or
overnight. Clearly it requires a far more sophisticated program to cope with these variations than with a public library system; it would be ridiculous for a public library to pay — in terms of cash or response time — for this sort of facility which it would never use.

When it comes to balancing possible features against response times, it is important for a library to establish its priorities — in particular, to establish which features of its service are essential and which merely desirable. In doing so, it is important to remember what new features will be available to compensate for desirable features which existed in the former system and now have to be sacrificed. It is easy to fall into the trap of grumbling about what we used to be able to do — leave readers to look up the lists of books on loan rather than have staff do it at a VDU was until recently a common moan at Reading — while forgetting that the new system not only gives an up-to-date record of what is on loan, as opposed to a listing up to two days old, but also frees staff from the task of looking up bibliographic details for the majority of overdue books.

One fact which has to be faced is that inevitably the automation of various aspects of a system removes some of the flexibility of a manual system. The temptation in such areas is to run both versions in parallel, often resulting in the worst of both worlds. To keep a manual file of reservation cards as well as a computer system is a waste — of readers’ time filling them in and staff time filing and retrieving them. The only possible reasons for cards are to cope with times when the system is down and to enable staff to batch the work on the system. To look up a book for a reader, inform him that it is on loan, and send him to fill out a card is ridiculous. The argument that the existence of cards also helps in cases where a system will not make a reservation because the book is not recorded as on loan is a spurious one — at least at Reading. The book could be issued to a number meaning ‘reported missing but wanted for a reader’ and the reservation then made. Although the shelves would need constantly to be checked from a daily listing of such books, there would then be no need to check the issue system each day — anyone trying to borrow the book would be stopped. For public
relations reasons one might let the book out for a short time, but it would have been traced — and all the files of reservation cards avoided.

On the other hand, there are times when the keeping of additional manual records is a sensible precaution. This may be the case with an interception list of wanted readers. The reasons are so diverse, and the detail of the comment so varied, that provision of space in the record may be uneconomic. It is to be hoped that the number of records is small, in any case. Code letters in the record can be used for any common reasons, such as lost cards or readers who have left before their membership expires without returning their card. A further example is registration cards, which hold one vital piece of data not recordable on a computer: the reader’s signature to a declaration that he will abide by the rules of the library.

The choice of equipment may well be restricted by what the chosen system will support; equally, however, it may be a factor in making a decision as to system. Cost is obviously going to be one factor here, although not necessarily the primary one. Size of display at a circulation terminal can be important. The Mark 3 Telepen units used *inter alia* by SWALCAP have a 32 or 36 character display only; thus messages are broken into segments, each of which has to be acknowledged by the operator. An attempt to issue a book not validly returned, therefore, results in the sequence **TRANSACTION INVALID** (Acknowledge) **BOOK ON LOAN TO READER NO.** (Acknowledge) **BOOK MUST BE RETURNED** (Acknowledge). This is a timetaking and frustrating sequence at any time, but particularly when there is a queue of readers waiting. When the light-pen is coupled to a VDU, either via a ‘Minipen’ interface or via software in the VDU, or as in the forthcoming Mark 4 terminal, the whole message can be displayed at once — a saving in time and operator’s blood pressure. Interestingly, the combination of Minipen unit and VDU can be cheaper than the standard Telepen unit.

The terminals on the GEAC system have light-pens connected to VDUs, but in their present form, the latter are small — a nine-inch screen only. This can have disadvantages
in legibility over the standard VDU – but advantages in terms of the space it occupies on the issue desk; if it is being used for circulation transaction messages only, it may be sufficient for the purpose. In many systems a VDU terminal will be able to perform more functions than a simple light-pen of the Telepen type, and at first sight this flexibility may seem important. There are occasions, however, when one might wish to limit the temptation for operators to perform a number of transactions, or for readers to demand a full service from an issue point, and might like the excuse to refer readers to a supervisory station. Nor can one always use this flexibility to reduce the appropriate number of terminals: in the Short Loan Collection at Reading University it was thought initially that a VDU/Minipen combination would double both as a second issue point and as a second enquiry point; in practice it was found that dealing with an enquiry while people were waiting to have books issued caused the same sort of frustration as waiting in a bank to cash a straightforward cheque while a street trader pays in his day’s takings, all in coin. The provision of two separate stations is now in hand.

It is important that the equipment in the library, whether the heart of the system or a communications link with a mainframe elsewhere, does not require constant attention or the changing of disks and tapes. The GEAC system as used by the Polytechnic of the South Bank provides such a system, in which the operator action is minimal. At the same time it must be ensured that security copies of the work done are taken, and this must not be too lengthy a process, nor must it involve taking the machine out of normal service. Whatever the equipment is, it must be easy for staff who do have to deal with it, particularly those who do so infrequently, to understand what to do – in other words, the equipment must be such that clearly intelligible instructions can be written for it. This has been considered in more detail in chapter nine, but it is of more relevance to a circulation system than to other library systems because the issue and return of books is likely to continue outside normal office hours, when systems staff and other experienced personnel are not available to assist with problems.
Equipment does break down — even the most rigorously tested modern computer equipment. This affects any computerized system, but nowhere are the effects felt so keenly as by circulation desk staff facing a queue of readers. One of the factors to be borne in mind in computerizing a circulation system is the number of points at which a single failure can switch off the entire service. With a manual system running in a position open to daylight or well-provided with emergency lighting, virtually the whole staff must be struck by plague before the service is completely halted. Once a number of terminals work from a single computer, the whole service can be cut by a failure of the power supply to the computer, or of the computer hardware. Individual terminals may lose power, or the communications link to the computer may fail. If the computer is acting as a communications link to a mainframe computer, whether at the central site of a co-operative or in the university computer centre, that link too is vulnerable.

It is therefore necessary to consider what you will end up doing if various elements fail, and how well the system will cope with the re-establishment of the service. No librarian wants to have to say ‘no issues’ when to all outside appearances his library is functioning normally. On the other hand, staff do not want to spend their time manually listing books and borrower numbers, and then keying these in subsequently. It was a great cause of annoyance at Reading University under its old ALS system that if for any reason the system failed (it was on the whole very reliable) the on-line ‘trap’ of wanted books and readers was lost, and unless it had recently been dumped on paper tape (if that system was working) the whole thing had to be fed in again manually — by means of very uncomfortable wheel switches! It may be possible to hold all returned books until the system is working again, although a prolonged break can cause storage problems, and can begin to affect the service to readers seriously in that the books they want are not available. Unless a number of terminals can be used to return books, there will be a problem actually coping with the work load. Other forms of backup involve expensive duplication of equipment. At Manchester University two minicomputers
were intended to run in parallel — a luxury which few of us could afford today. A similar system using two Prime 300s was found to be unworkable in Derbyshire, and an off-line backup is presently provided there. Experience has also shown another problem: if the system is generally reliable it is important to test the backup system regularly lest it fail when needed. Reading experienced precisely this problem with its standby telephone lines.

The system may work in such a way that as long as the local computer is working it can record issues and returns, probably on tape. It is important that it marks the time on these transactions, not only to prevent confusion if a book has been taken out and returned within the problem period, but to avoid difficulties if, after the system is fully established, there is a delay in reading the tape back. It is helpful if, on replaying the tape, the system can in some form give the messages it would have given on-line, about readers over-borrowing, invalid reader cards or books wanted for reservations — these last can be reclaimed from the shelves in most cases. If, because the system has failed at the local computer, the list of transactions needs to be keyed in, it is again helpful if a time is keyed in with them — but not helpful if this has to be done for every transaction unless the previous time entered can act as a default. For security backup, it is important that what is written to tape is also committed to paper, so that in the event of a failure to read back the tape the transactions are recorded and can be entered manually. It has been known for a full tape to be erased before reading!

Clearly, the more sophisticated the individual terminals the more chance there is of continuing normal library operation during times of difficulties. The existence of hand-held battery-operated bar-code readers can even overcome the problem of a major power cut. Visual display units with some memory, or, even better, microcomputers used as terminals to the system, may be able to store data while the main computer is off-line. It would, of course, be possible to set up a system which consists of a network of microcomputers, and as long as the volume of data does not exceed the capacity of such a system this perhaps provides the most flexible approach; there are, however, likely to be problems
of system design relating to the need for each terminal to store an up-to-date record of wanted books and readers. The Telepen stand-alone system marketed by SB Electronics works as a network, of terminals rather than microcomputers. The possibilities of networking in libraries are the subject of the project at the Polytechnic of Central London. The range of choice is between a belt and braces approach ensuring that the system can operate in power cuts, hurricane-force winds and volcanic eruptions, but utilizing a lot of valuable memory space in the computer, and a simple system coupled with a daily prayer that it will not break down. The answer must lie between the two extremes, the exact point being determined by the likely reliability and the number of possible points of breakdown.

Finally, it is important to ensure that any system will be capable of supplying the sort of management data which is required. This will vary from library to library and from time to time, and as is argued in chapter eleven there is a danger of getting too many statistics simply because they are there. The system introduced in Derbyshire in 1979 was capable of giving a report on use minute by minute, by category of reader, category of book, and class number of book. It is hard to imagine any librarian actually welcoming the arrival of such statistics on his desk, but this sort of record gives the flexibility to find information on patterns of use which will be useful. An academic library may well wish any historical analysis to contain reference to the courses of those involved; any library might wish to be able to check the pattern of use of a particular service point. The ability to check heavily-used and heavily-reserved books is obviously advantageous to stock management — even more so if a warning can be automatically triggered when reservations reach a particular level. (After all, one wants information about what extra copies to buy, not what extra copies one should have bought.)

The ability to acquire this simply is also important — particularly the facility to set up special categories of books for observation. At Reading University a large number of books were withdrawn from the Short Loan Collection in summer 1983 because there was little or no recorded usage over the past year. There was a suspicion that to some extent this
could have been caused by the short loan periods themselves, and it was therefore decided to check on the use of these books after their transfer to the main collection. Rather than feed in requests for analysis of 2,000 individual titles, all were given a special loan status which has no effect on the way they could be borrowed but enables the computer to isolate the records for analysis. The ability to monitor specific groups of books in this way is of great value; as is the ability to analyse the use of a book by title as well as by individual copy. It is worth half a day looking at the information available from various systems and thinking about what information one would actually like. Again, I would refer intending users of automation to the preliminary list made at the Polytechnic of the South Bank.10

References

5. Evans, Peter W 'Barcodes, readers and printers for library applications'. *Program* 17 (3) July 1983. 160-71.
6. Hawes, D F W and Botten, D A. *op cit.* 53.
I have deliberately called this chapter 'information retrieval' and not 'cataloguing', not only because I wish to deal with on-line databases as well as library catalogues but also because I feel it is important to look at the catalogue from the viewpoint of its function, rather than take the risk of its becoming an end in itself. This is particularly important in the context of computerization which allows new approaches to the question of cataloguing access like the methods used for accessing databases. In many libraries, indeed, there is talk of subject librarians having microcomputers on which to store their own database for answering enquiries; since many of these will be answerable from the library bookstock, the desire for this approach suggests some flaw in the present subject approach to the library catalogue.

A basic question to be answered with regard to retrieval, whether of references from a database or of records from a catalogue, is whether to use a fixed vocabulary or to search a text for relevant terms. If the latter approach is preferred, should it be the full text of the work, or an abstract, or in the case of books the sum total of the title and chapter headings. For this purpose, the designation of a personal name as 'author' or 'editor' and thus as an access point is equivalent to the selection of keywords within an abstract; in so far as the form used for an author's name is (should be?) always the
same, it is searching on a controlled vocabulary. The British Library Name Authority List is effectively a thesaurus for authors’ names as much as MeSH is for medical subject headings.

A number of the current databases employ some form of controlled vocabulary, even where the text — or at least an abstract of it — is available on-line. One reason is economic: it is quicker and cheaper for a computer to search an index than to search a text — just as it is, on a longer timescale, for a human reader. Modern computing technology is making this less important. There are, however, some theoretical arguments which favour this approach — particularly the question of subjectivity on the part of writer or searcher. In addition there is the problem of the metaphorical use of a concept — ‘in the light of’ is not a phrase which will assist a search in the field of optics — and of the relationship of two terms in a compound search: there is a distinct difference between ‘bridge engineering’ and ‘engineering victory at bridge’. Furthermore, the existence of controlled vocabularies can ease movement — from database to database, although at present the vocabularies in use differ widely, and from language to language. The free-text searching of natural language is likely to remain difficult for automatic translation, whereas it may be practical to hold a translation of a thesaurus within a computer, as in the case of IRRD or NASA.

The biggest problem in dealing with controlled vocabularies is producing the rules for deciding what terms are to be indexed. These rules must to some extent be understood by the searcher as well as the indexer; this lies behind all library instruction of readers in catalogue use, and it creates a barrier to the easy use of the system. The biggest problem is in the treatment of compound names; should ‘aircraft engines’ be split into its two components, and would the same hold true of ‘butterfly valves’? There is a British Standard (BS 5723: 1979) which sets out some useful rules in this area, and there is a draft international standard which follows similar principles. Of course, the user’s task may be simplified by allowing him to search by non-preferred terms which the computer converts automatically to the preferred term
before searching the index; this still presupposes that the decisions on the structure of the preferred terms have been made.

Those who favour free-text searching would argue that there are initial savings in that no form of human indexing is required. Moreover, they argue that matching the question of the objectivity of the terms is the point that free-text searching may pick up items under a wider variety of access terms. There is also less chance of conscious or unconscious censorship by an indexer who may not index something which forms only a small part of the paper concerned. (This is a problem known to any subject cataloguer: a book may be a collection of essays on fifteen specific aspects of a subject, all of which are entries in the subject catalogue for monographs on that aspect alone, but the collection is put one level higher as a more general work, and will be missed by searchers of the specific term.) Of the full-text, natural language searching databases offered commercially, the best-known are probably the legal databases, LEXIS and EUROLEX. These provide a good argument on both sides. On the one hand, searches for precedents need to be wide-ranging, and to retrieve items which were only a small part of their original case; the indexing of statutes, also, does not lend itself to the use of a controlled vocabulary. On the other hand, it is possible for a barrister to argue a point of law without once mentioning the point specifically; his argument will then not be retrieved by someone searching his text for that point of law. The difference can perhaps be summarized by saying that indexing with a controlled vocabulary provides a high proportion of relevance amongst retrieved articles at the risk of missing fringe items; free-text searching on a suitably wide variety of terms will retrieve a high proportion of what is relevant within the database, but as a much lower proportion of the items retrieved. Two possible objections to full-text-systems must be considered: the amount to be stored and the time taken to create the database. Storage costs are rapidly reducing, and even now a large database can be economically stored on disk; videodisk technology may increase the potential of economic storage still further in the next few years. Keying in a large amount of data would be a
formidable task; but this is not the only way. Where good quality printed texts are used as the basis, optical character recognition machines can achieve excellent results, and will enable the transfer of considerable volumes of material in a relatively short time. Nevertheless, one must keep a sense of proportion — one would hardly consider conversion of the entire stock of a library in this fashion to provide free-text searching of the full text of everything. In the case of current publishing, however, even this is unnecessary; a large amount of publishing output today is computer typeset, and therefore already exists in a machine-readable format. Looking to the future of electronic publishing mentioned briefly in a previous chapter, the mode of operation of such enterprises might well be to find the relevant articles by free-text searching and then to request the overnight or immediate delivery of the documents themselves.

In the case of commercial databases, of course, the user is not always offered a choice. The decision as to which databases to use will therefore be made on other grounds. It is important here to distinguish between databases and ‘hosts’ — the companies responsible not for compiling the databases but for allowing access to them. Normally a subscription to a host system, DIALOG, DATASTAR, EURONET DIANE, PERGAMON INFOLINE — will allow access to any of the databases within that system, although occasionally some may be restricted. A library is therefore likely to choose the host offering the widest variety of databases it is likely to use; the position of DIALOG as the most widely used host rests not only on its early appearance in the field, but also on the number and variety of databases provided. One advantage of using a single host, apart from the single subscription, is the similarity of the command structure throughout one set of databases; that is, of the sort of dialogue between user and system required to retrieve information. However, the problems in this area can to some extent be alleviated by the use of a microcomputer as a terminal. The microcomputer can be used to ‘translate’ the terminology of the most frequently used database into that of other systems in a manner totally invisible to the user; this is being achieved through the use of IBM Personal Computers at the University
of Illinois. Microcomputers of this sort can also be used to supply additional prompts, or additional information on system use, to users, as in the case of FRED, a front-end for databases.¹

Cost will, of course, play a considerable part in the choice of systems, and this is becoming more important as a number of databases are becoming available on various host systems. Some will be not only cheaper but easier to access than others, and may be accessible via lines transmitting data at higher speed, thus cutting both telecommunication and connect-time charges. Charges may also be reduced if a search can be entered onto the memory of an intelligent terminal or microcomputer, and then transmitted to the database — the slowest terminals will transmit at 200 cps, and few operators can type at that speed!²

This brings up the question of the method of using the databases. The two modes normally offered are: (a) in response to an individual one-off need; and (b) on a regular basis as part of an SDI service. The former satisfies postgraduate students making a literature search as well as those seeking initial reading on a specialized topic before starting a piece of research. This sort of search will retrieve commercial and financial information for companies planning new projects. Researchers, however, may very well be helped by a periodic update informing them of new papers in the field, and this is where the second service comes in. This is a clear case for storing the search details, once settled, on a microcomputer and running the search automatically (or virtually so — dates may need to be changed) at set periods. Such a service may relieve pressure on inter-library loans, if there has been a policy of allowing requests for the regular supply of title pages. It will also save the researcher's time in scanning abstracting journals and Current contents, a factor considered by commercial firms but largely ignored by academic institutions, where time is not seen as having a financial value. In public libraries the situation is more complicated, as there are more potential users and perhaps less direct commitment to individuals by the library staff than when both are part of a single organization with (supposedly) a united aim.

Regrettably, the question of charging users for the service
cannot be ignored in the decision as to whether to install such a service at all. It is not often that library committees are happy to make an open-ended commitment to fund such a system, particularly when (in the case of public libraries) there is always a suspicion that the user will profit financially from it. The discussion has been clouded by a clamour about the importance of a free public library service and the comparison with hard-copy versions often of the same databases which are available in libraries free. Without wishing to stir up too much controversy on a matter on the fringe of the subject of this book, it seems worth noting three points:

1. The purchase of a book or journal is not an open-ended commitment in the same way as use of an on-line database in that the price does not vary according to the number of users.

2. If the hard-copy is available, a user of the on-line version must be assuming there will be some advantage from so doing.

3. There is no 'free' public library service; only a communally funded one. Users have always been at liberty, and encouraged, to supplement the public service by purchasing — we do not encourage our readers to beware of bookshops! It is up to the community to decide the level at which it wishes to fund the service, and the directions in which this funding is to be spent, but there is still no reason why individuals should not pay for the extras they would like.

Working on these principles, it is for the library to decide firstly how far it can go in providing funds for this sort of service before the majority of users begin to feel that they are suffering for the benefit of a minority, and secondly whether at that level of funding sufficient users will be attracted to make it worth running a service.  

The net cost of an on-line service will be affected by whether savings can be made on hard copy versions of the databases. These may be made by complete cancellation of a title, or by purchasing only cumulative volumes and allowing the on-line service to cope with the current parts. The savings made can be quite extensive: the cost of Chemical abstracts,
together with its cumulative indexes, works out at approximately £6,000 pa; on top of this must be added the cost of binding — perhaps £300 pa — if the parts are not to get totally out of control, and of storage, which it is harder to estimate. There are, of course, in an academic library an enormous number of consultations of Chemical abstracts in a year — far more than the 250 searches for which the savings might pay. If, however, the time of the searchers were considered also, the extra expense would not seem so great. This is particularly so if a majority of the searches cover a number of years or are for complex topics involving a combination of terms. Few on-line searches are in fact worthwhile if the hard copy version is reasonably current, if the topic is a single one with no likely synonyms, and if the hard copy is well indexed.

One hidden extra which may be forgotten about in introducing on-line services is the staff time involved. Most readers can be left to use hard copy, since generally all books work in the same way — their ‘command language’ is the same. As already mentioned, this is not true of on-line databases; nor is one paying directly for the time spent turning the pages of a book the wrong way, or thinking of other possible indexing terms. Telecommunications charges, too, make it imperative not only that the search is designed in the most efficient fashion, but also that it is conducted by someone familiar with the equipment who does not spend a long time searching for the appropriate keys. Again, the use of a microcomputer enabling the search to be entered slowly and transmitted rapidly, can remove some of this need, but certainly at present there are still a number of very occasional users of searches who require library staff assistance in formulating and carrying out their search.

In considering the need for, and the place of, information retrieval from outside sources it is important to ensure that full value is being obtained from the information held within the library. A library has its own internal database — the catalogue. Normally it is not considered in quite this way: the catalogue is looked upon, and designed, as a key to the physical volumes, rather than the information, held in the library. This is partly the effect of a primary concern with
books, which are large packages of information not ideally suited for close analysis. It must be accepted, however, that part of the reason lies in the difficulties experienced by users in approaching a catalogue by subject. In a recent paper, Don Revill\(^4\) pointed out that the predominance of searches for a particular title rather than for subjects in observed catalogue use may result from the realization, conscious or subconscious, by readers that this is really the approach the library provides. Indeed, where better subject access is available — for example by keywords at Liverpool Polytechnic or through GEAC at Hull University or Sussex University\(^5\) readers seem eager to make use of it. The medical library at Edinburgh University recently started using Medical Subject Headings (MeSH) as the basis for its subject approach; within six months this had become the catalogue of first resort for most users.\(^6\) In most British libraries with manually-compiled catalogues subject access is provided by a classified catalogue, so that approach is a two-stage process requiring use of an index first. In some cases, systems such as Library of Congress Subject Headings enable users to get directly to the subject they want; there is, however, no hierarchical searching possible (if you fail to find anything useful under ‘Reading — Archaeology’ you have to know that the next stage up is ‘Berkshire — Archaeology’). Moreover some readers have problems with fixed vocabulary systems, and with LCSH applied strictly it is impossible to have the rotation which classified catalogues may allow: one cannot have both ‘Universities — Great Britain’ and ‘Great Britain — Universities’.

In many cases the catalogue has altered very little with computerization. Traditional author and subject, name and subject, or dictionary catalogues are produced on COM fiche; sometimes the subject indexes are so produced also. With any form of hard-copy output, it is hard to be anything but traditional, although once the entries are in machine-readable form they can be easily manipulated. The constraint on rotating LCSH, for example, then comes from two sources — the desire to follow the established practice and the cost of processing multiple entries. Both of these are entirely understandable, and indeed quite laudable aims, but they militate against making full use of the potential of the computer.
Even having regard to the difficulties caused by requiring hard-copy output, there are variations which can be produced. With small files, or files where single-line entries are sufficient to identify material, and where the titles are reasonably descriptive of subject matter, the KWIC (Keyword in Context) index acts very much like a hard-copy version of a free-text search. For certain types of specialist material it can be invaluable — I used one for the European Communities collection at the John Rylands University Library of Manchester, and it facilitated both primitive subject searching and the tracking of publications by half-remembered titles. A more satisfactory compromise is the KWOC (Keyword out of Context) index, which enables a fuller descriptive record to follow the keyword, rather than being linked to it by a number. Figure 5.1 shows a frame from the catalogue of Liverpool Polytechnic Library. Keywords can, of course, be assigned from a thesaurus, or found in the natural language of the title concerned; the latter, while still requiring staff to choose the keywords rather than the more automatic process of a KWIC index, can be a fairly rapid method of subject cataloguing. For some years such a system has been in use in Liverpool Polytechnic — the AMY system. Liverpool Polytechnic hopes to continue to use a keyword approach through SWALCAP because it has proved so popular with users.

For an on-line catalogue the opportunities are naturally much greater. Free-text searching becomes a possibility, as does keyword searching (whether on the natural language of the title or on a fixed vocabulary) using Boolean logic to combine keywords for greater precision of searching. This keyword approach can also cope with the traditional uses of a catalogue as a finding tool for specific books — authors’ names can be treated as keywords, as can significant parts of titles. Indeed, it is interesting that the on-line catalogue of St Andrews University Library allows keyword access because this was the easiest solution to the multiple author approach. In providing better access to the information held in the library — subject access — one must be careful not to destroy the other purpose of the catalogue, as a location tool for finding a specific book. Its collocative function in respect
Figure 5.1 Frame of Liverpool Polytechnic keyword catalogue.
of authors, as a way of drawing together the works of an individual, must equally be retained. In terms of either free-text or keyword searching this may involve structuring both the record and the search so that the function of the keyword is known. One wishes to avoid the situation, where a search under 'Stirling' and 'University' produces both material on the institution and the book *University librarianship* edited by John Stirling; or a search by 'Brewer' retrieves books published by D S Brewer in addition to those written by him, not to mention those concerned with the making of beer. This can be catered for, as in searches on BLAISE, by the addition of qualifiers to search terms to indicate a group of fields (MARC fields in the case of BLAISE) which are to be searched (Figure 5.2).

<table>
<thead>
<tr>
<th>SEARCH QUALIFIER</th>
<th>FULL NAME</th>
<th>MARC FIELDS FROM WHICH SEARCH TERMS ARE DERIVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>(AU)</td>
<td>Author</td>
<td>100, 110, 111, 700, 710, 711, 800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>810, 811, 900, 910, 911</td>
</tr>
<tr>
<td>(AV)*</td>
<td>Physical Description Code</td>
<td>037</td>
</tr>
<tr>
<td>(BL)</td>
<td>BLAISE number</td>
<td>024</td>
</tr>
<tr>
<td>(CN)</td>
<td>Control Number</td>
<td>001, 010, 015, 021, 022, 440, 490, 700, 710, 711, 740, 745, 800, 810, 811, 840, 110, 111, 710, 711, 810, 811, 910, 911</td>
</tr>
<tr>
<td>(CW)</td>
<td>Corporate Word</td>
<td>695</td>
</tr>
<tr>
<td>(CY)</td>
<td>Country of Production</td>
<td>008, 044</td>
</tr>
<tr>
<td>(DA)</td>
<td>Date of Entry</td>
<td>008</td>
</tr>
<tr>
<td>(DC)</td>
<td>Dewey Decimal Class No.</td>
<td>061, 082</td>
</tr>
<tr>
<td>(GA)</td>
<td>Geographic Area</td>
<td>043</td>
</tr>
<tr>
<td>(IC)</td>
<td>Information Codes</td>
<td>008, 046, 080</td>
</tr>
<tr>
<td>(IT)*</td>
<td>Index Term</td>
<td>695</td>
</tr>
<tr>
<td>(IW)*</td>
<td>Index Word</td>
<td>695</td>
</tr>
<tr>
<td>(LA)</td>
<td>Language</td>
<td>008, 041</td>
</tr>
<tr>
<td>(LC)</td>
<td>LC Class Number</td>
<td>050</td>
</tr>
<tr>
<td>(MO)</td>
<td>Number borne by item</td>
<td>538</td>
</tr>
<tr>
<td>(NS)</td>
<td>Name Subject</td>
<td>600, 610, 611</td>
</tr>
<tr>
<td>(NW)</td>
<td>Name Subject Word</td>
<td>610, 611</td>
</tr>
<tr>
<td>(PD)</td>
<td>PRECIS Descriptor</td>
<td>690</td>
</tr>
<tr>
<td>(PL)</td>
<td>Place of Publication etc.</td>
<td>260</td>
</tr>
<tr>
<td>(PS)</td>
<td>PRECIS SIN Number</td>
<td>691</td>
</tr>
<tr>
<td>(PU)</td>
<td>Publisher/Distributor/</td>
<td>260</td>
</tr>
<tr>
<td></td>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>(FW)</td>
<td>PRECIS Word</td>
<td>680</td>
</tr>
<tr>
<td>(PX)</td>
<td>Dewey Pre-explosion</td>
<td>081, 082</td>
</tr>
<tr>
<td>(SC)*</td>
<td>Scale</td>
<td>256</td>
</tr>
<tr>
<td>(SH)</td>
<td>LC Subject Heading</td>
<td>650, 651</td>
</tr>
<tr>
<td>(SL)*</td>
<td>SRL Class Mark</td>
<td>095</td>
</tr>
<tr>
<td>(SW)</td>
<td>LC Subject Word</td>
<td>650, 651</td>
</tr>
<tr>
<td>(TK)</td>
<td>Key Title</td>
<td>222</td>
</tr>
<tr>
<td>(TS)</td>
<td>Title Subject Word</td>
<td>600, 610, 611, 640, 645</td>
</tr>
<tr>
<td>(YR)</td>
<td>Year of Publication</td>
<td>008</td>
</tr>
</tbody>
</table>

*Figure 5.2* Qualifiers for MARC searches via BLAISE.
(Courtesy British Library BSD.)
I have already discussed in connection with on-line information retrieval from external databases the problems which occur in using fixed vocabulary and natural language as a basis for searching; they apply as much to the library catalogue as to anything else. However, the potential size of the library catalogue is another factor to be borne in mind. The size does not rule out any particular type of searching, but the wider the vocabulary the longer the search will take (since to approach any sort of comprehensiveness synonyms will have to be used); while the processing time taken for a search through entire records may also be too great for acceptance. In the case of on-line information retrieval it is not unusual for a search to take fifteen to twenty minutes; I suspect that the majority of users will not wish to spend this amount of time in catalogue consultation. One method of cutting down the processing time in retrieving catalogue records is the use of acronyms. Constructing an acronym allows the index to the complete file to be of fixed-length fields, which assists the internal operation of the computer. Unfortunately, there is no obvious way of applying this to subject retrieval. The construction of the acronym, as used in OCLC or SWALCAP and proposed for UKLDS,\(^\text{10}\) is not something with which to face users; but since the acronyms for the records are created automatically, a conventional author or title input at a terminal can also be converted into its acronym form, thus making the method transparent to the user. Such facilities are available in some systems, for example ADLIB.\(^\text{11}\)

The question of using some degree of processing between the user and the system is one which has not yet been fully explored or exploited. SWALCAP has experimented with a program which not only creates an acronym from a full term input, but matches the appropriate area of the retrieval records against the input term to weed out irrelevant items. Thus SMITHSON gives an acronym of SMIT, but the user is spared records by SMITH. The University of Illinois has made use of IBM personal computers as an interface between user and database to enable the user to employ the same command language for all databases: the conversion is done by the PC. Similarly an ‘intelligent’ terminal could ‘translate’
terms for searching a database in a different language. In the case of a library catalogue, it could be used to overcome a number of the features which impede catalogue use. All ‘see’ references, for example, could be immediately converted into the preferred term (a point made by Derek Austin in relation to thesauri);12 ‘see also’ references could be more conveniently presented by an option, ‘press (a key) to see associated entries’. When it comes to subjects, the subject index could be stored in the terminal so that the input of a term would automatically produce the entries in classified order. Even where the subject approach used was LCSH it might be possible to store a hierarchical structure within a machine which could not be contemplated in a hard-copy catalogue. Some of the possibilities are indicated by the ‘Paperchase’ system used in the US National Library of Medicine, which leads from keywords input by a user to terms in Medical Subject Headings; UCLA’s ORION system has similar features.13

However, all these are methods for dealing with the conventional approach to catalogues, by strict rules and classification schemes. Most of these approaches presuppose that the user both knows how the system works (e.g. that an author is entered by surname first) and has fairly precise details of what he wants. The closest that such approaches come to coping with imprecision is in the use of acronyms, particularly where ‘wild’ characters are allowed (so that SM?T could retrieve SMITH or SMYTHE). It is certainly the hope of many involved in computerized cataloguing that less structured methods of both input and retrieval will be possible, enabling savings in cataloguing time and catering for less exact searches. The increasing use of keyword and free-text searching perhaps implies a general move away from classification schemes except for shelving and location purposes. If this is the case, then it may be that a different sort of subject information is now required in records. If the title itself is inexplicit, or insufficiently descriptive of the whole content of the book, perhaps the record should contain chapter headings also; captions of figures in scientific and technical works could provide a useful additional guide.14 Perhaps rather than PRECIS strings we should be asking the
staff in our national library to produce abstracts which could be included in the record; or perhaps we should request them from authors, as is done with theses for higher degrees. Some of these possibilities are being explored by the MARC Users' Group in the follow-up to their successful questionnaire on the use of the MARC record. There is a circular process at work which is important to grasp. A manual catalogue can only have limited access points, and therefore requires rules (eg AACR2) to enable these access points to be predictable. A free-text system allows these rules to be ignored, although with the problems of uncontrolled vocabulary already referred to. However, as the database increases in size, free-text systems become expensive to update, and so some structure in the form of a database management system is introduced. This in turn reduces the number of access points and re-introduces the need for formality. This has recently been discussed in much greater detail in an article by J H Ashford.\(^{15}\) It is important to realize the implications of this, since a library coming into the system at the middle stage may find itself needing to return to structured methods later, but with records which are unsuitable.

One way to keep this situation at bay is to keep the records to be searched as short as possible. Many of the keyword searching systems have been developed in conjunction either with short entry catalogues, as with Liverpool Polytechnic's AMY, or with backup files for a circulation system, as at St Andrews University. This raises the question of how detailed a catalogue record actually needs to be to serve its purpose adequately. The Bath Centre for Catalogue Research have recently published a study of this question which leans towards shorter entries.\(^{16}\) Other members of the profession have argued that full details are needed, if not for readers, then for library use. The arguments advanced include precision of pagination where an author has produced a book and a pamphlet with similar titles, or detailed series information if the book forms part of a series purchased by the library on standing order; these details may help to prevent the purchase of unwanted books or unnecessary duplicates. Equally a full and exact bibliographic description of a book may be required for students of printing and publishing history.
At this point it becomes necessary to distinguish between the record and its output. Because there is a mass of detail held in the computer, there is no obligation to confuse the reader by presenting it in full. If the catalogue is on-line, different forms of output can be made available; SWALCAP has a unit entry (much like a conventional catalogue card), a MARC format with irrelevant fields (as defined in a parameter by the library) removed, and a full MARC format; in acronym enquiries an initial short description also appears. If a hard-copy catalogue (COM fiche, for example) is being offered to users, the more detailed information can still be called up on-line by library staff, who have access to very simple keys such as ISBNs. Only if the system is off-line does the library have to balance the cost of producing two parallel catalogues against the cost (impossible to quantify) of the confusion a detailed catalogue may cause among users.

An objection to the entry of any detail at all into the record is the time it takes and the greater skill required of cataloguers, both of which increase the cost of cataloguing. The skill argument I feel can be overplayed; the skill lies in the best application of whatever form of subject approach is adopted, not in the counting of pages. The time factor is a valid point, but one answer is the sharing of the work among a number of libraries (via a co-operative); another is the centralization of the detailed work in the national library. In fact, co-operatives mix both systems, which ought to provide the best of both worlds. It has even been suggested that if the United Kingdom Library Database System should become a reality libraries might store only the shortened version of the records which was the normal requirement; more details would be obtained by accessing the record on the central database.17

Although co-operatives in general are the subject of a later chapter, certain aspects of co-operatives relating to cataloguing must be considered here. One aspect which cannot be ignored, especially in the light of the discussion on full and short cataloguing, is the MARC record. MARC is a format, and as such lays down no obligations for a particular length of record — just because a field exists, it does not have to be used. If there are any stipulations as to the degree of detail,
they belong to the agency, such as a co-operative, through which the MARC record is used. The essence of MARC is that it is an exchange format with an international standard (ISO 2709); an agreed way of making sure that the cataloguing done by library A is received in the same form by library B. The decision on whether or not it is relevant to a library is more likely, therefore, to depend on whether or not records are required from outside the library.

The fact that a MARC record may contain much more data than is required is not really relevant to this decision, although factors such as the subsequent size of the file and the level of programming required to cope with the MARC structure will also need to be taken into account at some point. The important things to ascertain are: that the MARC record will contain the bulk of the information that is required; that this will be in a form suitable for the library's use; and that MARC records of this standard can be obtained for a sufficient proportion of books at the time they are needed. Leaving aside the question of Extra-MARC Material (EMMA) — cataloguing of books in the MARC format carried out other than by national cataloguing agencies — which is perhaps best considered in the context of co-operatives, it is unlikely that a full MARC record will have insufficient or inadequate descriptive data.

This will not necessarily prove true of Cataloguing in Publication (CIP) records, however, in which the title information — particularly at the level of sub-title — frequently relates to what the publisher thought it was going to be rather than what actually appears on the title page. There are a number of reasons for this, and for the delays in upgrading CIP into full status, which relate to the practices of publishers as well as of the British Library Bibliographic Services Division, and in particular to the relationship between them.¹⁸ What is perhaps more worrying is the announced intention of BLBSD to expand the CIP programme at the expense of some of the revision.¹⁹ Although various safeguards are promised, it is not at all certain whether the product of this system, while it may be better than some present CIP records, will match the standards of present full MARC records. Any library basing its decisions on the
present system should look very carefully at what is proposed
for the future.

As to the records being in a suitable form, this relates
primarily to the willingness of a library to implement AACR2
in full, which the British Library has now done. As far as the
form of personal and corporate author headings is concerned,
there will be no problem so long as an existing catalogue has
been reconciled with the British Library Name Authority
File (available on microfiche). Nor will there be problems of
internal inconsistency within a catalogue if a new catalogue is
to be started. How far headings will differ from those in the
earlier catalogue will of course depend on the rules followed
previously. If for any reason a library wishes to continue to
follow earlier rules, whether for existing headings only or for
new headings also, this could involve considerable alteration
of incoming records. The area in which this is most likely to
occur — the area in which AACR2 rules are perhaps most
questionable — is that of series entry. Many libraries — parti-
cularly academic libraries — find that entering a series as
‘Proceedings’ followed by the issuing body in round brackets
is unhelpful — ‘Proceedings’ becomes a long entry, and
frequently users know that a monograph was published by a
learned society but are not sure if the relevant series was
other such title. (In some cases I am sure that the learned
bodies have been less than consistent.) There is also an im-
pli- cation for MARC coding, in that the British Library use two
fields for such titles — 490 with the statement of responsi-
bility in a subfield, and 840 (which actually produces the
entry) with the statement of responsibility in round brackets
in the first subfield. This may seem a nit-picking point, but it
can involve producing a similar pair of fields in records
created locally, adding to the work and to the complexity of
the cataloguing. Again, any library intending to use MARC
records would be well-advised to consult the Cataloguing
practice notes published by BLBSD.20

The existence of a suitable record at the time it is required
has been one of the main talking points in the profession in
recent years. Even if libraries do not wish to use a MARC
record as a basis for an order, they may wish to order a
MARC record when they order the book, in the hope that it will be present on the book’s arrival. It is the satisfaction of this need which lies behind BSD’s proposal to expand the CIP programme; it results in part at least from the study of the currency of CIP being made by the Bath Centre for Catalogue Research. Latest figures suggest that CIP records are satisfying about 20% of user requests. Whether such records are of a satisfactory standard is a matter of some debate. These are of course only average figures, and it would be worth the while of any library contemplating automation using MARC records to do a study related to its own particular intake. This might be done manually by checking the existence of records in BNB; on-line using BLAISE; or through a friendly library which is a member of a suitable co-operative, although this would almost certainly call for some agreement as to payment. A prima facie case may be made one way or another by checking the number of books which possess ISBNs or LC numbers; not all will be available (although all those with LC numbers should be on the US MARC tapes), but it is unlikely that much material without these numbers will be retrieved unless use is being made of a co-operative. This could be changed by the advent of the United Kingdom Library Database System (UKLDS) which might allow access to EMM to libraries not themselves members of co-operatives, but which have the ability to process MARC records. As the questions which then arise will be similar in some respects to those related to joining co-operatives, I have discussed them in a later chapter.

Even if MARC records are available, and contain descriptive data in the form required, it may still be the case that the time taken to acquire them and to add to them the necessary local data and subject data, together with the costs incurred, will prevent the desired savings being achieved. Unless the library’s classification is LC, DC18 or DC19 it is going to be impossible to accept the classification without query; even if one of these schemes is used, a library may use only a shortened form – although there are possibilities for automatic truncation of DC. The number of secondary classifications given is limited. LC headings are normally provided on MARC records for those few libraries which use them, but
there are occasional differences of interpretation between BLBSD and LC which make it difficult to accept them without question. Moreover, the filing of LCSH can present a major problem; historical subdivisions, for example, require either a very complex program or the input of an alternative filing string to sort the sequence:

Elizabeth, 1558–1603
Elizabeth II, 1952–
George I, 1714–1727
George II, 1727–1760
George III, 1760–1820

into something historically meaningful, while also inserting such general periods as 'Puritan Revolution, 1642–1660' into the correct place. There comes a point at which the need to check data in a CIP record, and to modify data in subject areas, together with the additional series data and perhaps subject filing strings required in locally created records to ensure correct interfiling, makes the proposition of using externally created data to reduce the staff time spent on cataloguing look less than attractive. Nevertheless, the existence of subject data in the record, even if not in a form which can be directly used, may assist the cataloguer by directing his thoughts in an appropriate direction. Equally, libraries have undoubtedly found that there are savings to be made in using externally created records.22

Undoubtedly the greatest objection to MARC, and the one hardest to answer, is the complexity of the structure. While a cataloguer need not learn the significance of every field, in systems using any but the shortest records he will in fact need access to most — especially in a shared system, where the data put into a note field, for example, by another library may have relevance to what the cataloguer is doing. It is interesting that SWALCAP now offers a facility to filter out from the screen display unwanted fields; certainly at Reading there have been very few fields found to fall into this category. Not only does the field structure have to be learned, but also the subfield structure within each field, which varies widely. Naturally the more frequently used elements tend to stick in the mind fairly frequently — 100
for personal authors, $a$ for surname, $h$ for initials or forenames; but even moderately experienced cataloguers may have to check the subfield for numerical designation of a king or pope, or parallel title. Some subfields are related to whether the data is to be used in output or not — particularly date qualifiers for names, or spelled-out forms of personal Christian names. It would be wrong to think of the MARC format as an insurmountable problem in the way of cataloguing; nevertheless it is in no sense 'user-friendly', and it would not be wise to ignore its initial effect on staff who are to work with it.

Conversely, by adopting a system other than MARC many of the problems of cataloguing can be eased, but at the cost of other elements elsewhere. Thus prompts on the screen can ask for author, title, date, etc, avoiding the need to learn a coding structure. All authors can be interfiled, as can titles with authors, by a fairly simple sort program. Additional authors or editors can be added, as can all relevant classmarks or subject headings. Provided the processing power of the system is large enough to handle a batch of MARC records, it is still possible to buy these in from outside and convert them from their elaborate format into the simple in-house structure. The short entry bibliographic file of the GEAC system can be worked in much this way. The University of Surrey use a prompted system of cataloguing which enables them to cope without difficulty with most of their stock.23 The Liverpool University AMY system does not require elaborate analyses of the types of authorship (Figure 5.3).

However, use of MARC can be simplified. As with online retrieval from a database, the existence of suitable 'help' messages can be useful. These must be properly constructed to be of assistance: the message on the SWALCAP Mark 1 cataloguing system: 'Format is TTT:L/R.II' was not much help to anyone who did not already know the answer. Help messages may need to be specific to the particular library, and give some assistance with local practice. Where the terminal has sufficient processing capability, it is possible to display the possibilities to the cataloguer, eg:
(b) SUR Title

The subtitle is given unless it is lengthy or irrelevant.

(c) AUTHOR STATEMENTS

The author or authors names are preceded by one of the following authorship statements:

By
(d) by (edited by)
Comp. by (compiled by)
Illus. by (illustrated by)
Illustrators are given only when they are of interest to the Art & Design Library.
Rev. by (revised by)
Prod. by (produced by) used for corporate authors where there is also a personal author
Organ. by (organised by) used for conferences, exhibitions etc.
Trans. by (translated by)

Personal authors Surnames and initials only are given e.g.

McKean, M.T.

Surnames with apostrophes are written omitting the apostrophe e.g.
O’BOYLE is entered as

CORRIG

Surnames beginning with Mc are written in full as MAC, e.g. McDonald is entered as

MACDONALD

Corporate authors Societies, institutions, companies etc. can be given as authors, but the names are often abbreviated e.g.

LIVERPOOL MUSEUM

L.M.

I.R.I.E.

The Authority Files and catalogues should be checked for the correct initials.

Continued ... Where there are 4 or more authors only the first author is given e.g.

; BY CRAIN, L. AND OTHERS

Two or three authors are catalogued as follows:-

; BY LEITOURGIE, T. AND WILLS, R.E.

; BY CARROLL, R., JEFFREYS, R. AND DAVIES, D.B.

Various levels of authorship are regarded as joint authorships, e.g.
"By V. Hird with assistance of K. Owen" would be catalogued as

; BY HIRD, V. AND OWEN, K.

Different categories of authorship e.g. (authors, corporate authors, editors, illustrators are given separately - each preceded by a semi-colon e.g.

; BY ROWLANDS, P. ; ED. BY CORR, T.L. ; ILLUS.

BY WILKINSON, P.

; ED. BY RICH, P.B. AND CORLEY, D. ; PROD. BY

INSTITUTE OF BUILDING

; BY KANG, P.O. ; REV. ED. BY POOK, D.

As many different categories of authorship should be entered as is reasonable. However illustrators and translators are not usually given unless they are of particular interest to the library in question (e.g. illustrators for the Art & Design Library, and translators for books to be studied in literature courses).
Key in author
(100 Personal author
 .00 Direct order
 .10 Inverted name
 .20 Double-barrelled inverted name
 .30 Family name)

It should equally be possible for the cataloguer to preset the level of assistance he will require when he starts his operations, and to vary this during processing.

What non-MARC systems lose is the potential for manipulation and retrieval in the MARC record. Because the information in MARC is broken into very small sections, it is theoretically possible to make all sorts of searches. Some, of course, are facilitated by the fixed-field codes at the beginning of the record — language of book, type of illustrations, area of main treatment and so forth. Unfortunately in practice only a limited number of these are used by libraries in their own local cataloguing, for reasons both of time and of the burden imposed on staff by having to use a large number of codes. The MARC format also enables (in theory) much more specific searches to be made — books with X as author but not editor or joint author — or more comprehensive searches: all books in the library about Zambia whether that is the first or a subsequent sub-field of a Library of Congress Subject Heading. I say 'in theory' because few places have programs to perform this, and the processing time required is large for a result of questionable use. Of more value is the possibility of defining certain elements as a means of selecting records — not just all records of a particular class number, but perhaps all those with a particular prefix; or all those by a particular publisher or printer — useful for libraries with important collections of private press books. This sort of search (without of course local information such as location) is available on BLAISE, proving that it can be used on a large database; the software is not at present available anywhere else.

With regard to the use of the MARC format for subject retrieval, I have already mentioned the work being undertaken by the MARC Users' Group. Mention should also be
made of the value of the PRECIS string, which is to be found in UK MARC records. As a sophisticated form of retrieval, in which the function of the terms is defined, it is theoretically very sound.\textsuperscript{24} The problem lies in the difficulty of constructing the PRECIS string other than centrally in the British Library, and the sophistication of the programs required to use the strings has again kept this too confined to the central system. The whole question of whether the sort of subject retrieval indicated above can or will be replaced by keyword-style searching on titles or specific keyword fields still awaits resolution, as does the future of the MARC record in the light of which direction is taken. An experiment at SWALCAP showed that keyword access with respectable response times was possible on the title field (245 $a$ only) of a file of 140,000 records, and discussions are taking place on the best ways of developing this, possibly in conjunction with acronym access for main authors.

It remains to look at the practicalities of operating an automated cataloguing system. Although all the co-operatives and many local systems are geared to work being done online, some still make provision for data to be keyed in as a batch operation. This is a mode which often suits smaller libraries, who do not want to invest in local computing power and perhaps even wish to farm out their data entry to a bureau. (Interestingly SWALCAP is contemplating a ‘best of both worlds’ system, with local micro with a fixed disk drive coming on-line over a telephone line once or twice a day, to exchange records; records for editing would be displayed on the screen in on-line mode, but on-line only to the micro, not the main system.) Other libraries have felt that with on-line facilities available, they should avoid any contamination by paper. The book is picked up, the record called up, edited then and there, and released for catalogue production.\textsuperscript{25} This works well when the record is available, is of as high a standard as the library requires, and can be trusted as to heading and classification; otherwise these last two will have to be checked before going to the screen – it is very wasteful of time to have to keep leaving the screen to check a catalogue (even on a microfiche reader) or classification schedules. The danger in such a system is that every so often the record on
the screen will be treated in a way the cataloguer has not expected, and he or she will have to go away and check.

Where the record must be created locally, some preliminary checking will have to be done, and the results will have to be written down. While odd scraps of paper, envelopes and cigarette packets can be used, there is something to be said for having a properly designed data input form, if only to prompt the cataloguer as to fields to put in, and ones which may be of use (Figure 5.4). Some libraries — they are still the majority — like to see hard-copy versions of records before the cataloguing is done: these then act as data input sheets. When these are being requested, it is worth checking that there is a way of ensuring that they do not arrive until the book does, even if requested at time of order. I recall seeing some years ago a filing cabinet full of diagnostic sheets in Manchester Polytechnic Library; the filing of these by 10-digit ISBN was difficult, and retrieving them when books arrived even more so. There is one managerial benefit which may result from the combined use of paper: it may make possible the use of separate keyboarders. These are likely to be faster than cataloguers, as well as paid less; the latter point means that if and when the system goes off-line the expensive cataloguers can continue their work, and only clerical assistants sit twiddling their thumbs. The wider implications of this will be explored in greater depth in the sections treating the question of staff in a computerized system.

It is also important to consider what reports are generated from the system, and whether they convey useful information. Drawing on experience at Reading, reports indicating that a record which has been requested is already present on the library's file have shown up unwanted duplicates at an early stage, or multi-volume works where the set ISBN has been (mistakenly in our case) used instead of the volume ISBN. Where the two copies are for different branch libraries the report has prevented the apparent failure of one copy to receive a record — without the report both copies might have been catalogued separately. Indications that a record already exists on the catalogue file under a control number just used again have been important in the context of the SWALCAP Mark 1 system, but will be of little relevance in future. The
<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 5.4** Catalogue input form with reminders.
placing of this report at the end of the useful (but in our case bulky) report of items which have been waiting for cat-
aloguing twenty weeks or more has caused it to be missed on occasions (normally by me) — a reminder of how important it is to know how the reporting system works.

In contrast, the statistics reports have not been helpful, and even the better ones in the Mark 2 system are still less than we should like. Both systems indicate the number of MARC records requested, and also the number of books catalogued that week which had MARC records and the number which were local creations. There is, however, no way of knowing for how many books originally the subject of a request for a MARC record such a record was actually obtained — the all-important question of ‘hit rate’ — nor of the time these records took to arrive; no distinction is made between full MARC records and CIP. In the Mark 1 system books could not easily be divided into different categories — an indicator was used to distinguish ‘recataloguing’, but this caused ambiguity between retrospective cataloguing new to the computer system, addition of extra copies to records already in the system, and the amendment of inaccurate records. Better facilities for this sort of analysis are available in the new system. Equally improved is the count of the number of records on the file, which did not distinguish between serials, books and references. It is important to be sure that, if possible, the chosen system produces useful statistics, and if not, that their limitations are known.

Finally, there is the question of the output form of the catalogue. The possibilities are: cards, computer print-out, computer typesetting, COM (film or fiche), on-line access at a VDU, or any combination of these. Computer typesetting may be very rapidly dismissed — it is expensive and is only of value for occasional updates of the catalogue of a really large and important library which wishes to sell its work to people who may not wish to use or purchase it in machine-readable format. The obvious example in this country is the production of BNB, where the circulation and type of use justifies the cost. Computer print-out is normally the bottom end of this range; as a format, its scannability appeals to users (although frequently not its legibility), but unless entries are
extremely short and the catalogue itself of limited length, it is bulky and can be difficult to use. One of the earliest computerized systems, Camden Public Libraries, made use of this, but it has since been dropped there as elsewhere. It has a part to play for short listings required quickly — for example, it is used at Reading University for the weekly accessions list. The quality of the printer is important, and laser printers are changing the possibilities — the combination of high quality print, varied typefaces and diacritics, and possible multiple prints make this a possible alternative to computer typesetting.

The use of cards as output from a computerized system seems — and in many ways is — a remarkably inefficient way of using it. Even if the cards themselves arrive in the correct sequence, time still has to be spent filing them into the existing catalogue — and filing, it will be remembered, is one of the tasks of which a computer can relieve library staff. Cards are often printed four or eight to a ‘page’ of computer stationery, and require guillotining — and drilling if a rodded catalogue is in use — before they can be filed; where the receiving library has no in-house bindery this may not be a simple operation. Nevertheless, it is only comparatively recently that SWALCAP has offered a fiche alternative — Bristol and Reading Universities were both using card output up to summer 1982. OCLC Inc had no COM options until recently, and many American libraries still take card input. The advantage is the ability to maintain a single catalogue of computerized and non-computerized stock, with obvious benefits to readers (although I suspect there are disadvantages too, and I shall return to this). This presupposes, of course, that headings at least are compatible, which explains the persistence in the USA, where LC cards have been in use for many years providing a single consistent pattern of cataloguing in most major libraries.

There are still some uses for cards even in a COM system. Academic libraries may have to provide departments with catalogue data for books of interest to them, and these departments may be maintaining card files. Libraries with their own binderies, or sending large quantities of material to commercial binderies, may find it useful to have a card on
which the details for spine-titles can be marked up. In many libraries shelf-cards or stock cards continue to arrive in that format. This is again because the primary use of such cards is for stock-taking, and for this a single sequence is essential. Mention of stock cards reminds me that computers in multi-library systems — co-operatives or bureaux — are usually geared to producing output for the standard 5” × 3” card. If odd-sized cards are in use (as are Reading’s stock cards) compromises may have to be made, and in some cases small amounts of data lost.

COM output is by far the most common form in the UK, and fiche has become the generally accepted format. Film — at least cassetted film — does have some advantages in terms of ease of use, although the need to run almost to the end of a cassette to find an entry can be frustrating. It is more expensive than fiche, and so is the equipment needed to read it (especially if powered forward and reverse wind are required); moreover, this equipment, having little other use, is unlikely to be available elsewhere in the university. Many departments have fiche readers with, or which can be fitted with, lenses of suitable magnification for COM, and this enables the distribution of the catalogue throughout the university. Fiche readers are also comparatively cheap, and fairly easily maintained — although it is important to remember that they will require regular cleaning of lenses and protective glass. The expected disadvantages of fiche over film, namely that the individual fiches would get out of order or get lost, has never become a problem in practice. In most libraries which have used fiche there has been some initial resistance among some readers, but this too has been more of a problem in anticipation than in fact.

Typographically, COM can offer far more variety than a printer — different fonts, diacritics, and even different alphabets being possible (although the last presupposes that capability within the computer system). However, there is a distinct reduction in speed of arrival of the catalogue, since a tape must be produced and fed into the appropriate machine, and the fiches have to be processed as film negatives. Moreover, in most cases the actual production will be done by a bureau, and this involves postal delays in sending
the tape and receiving the end product — not to mention postal costs. Bureaux vary in the number of 'type faces' they offer, and in the method of production and layout of the eye-readable heading at the top of a fiche. In adding in transmission to and from a bureau, two further possible points of error have been added; the wrong tape may be sent, and the catalogues may be distributed to the wrong place. Other, more minor, problems can occur: not only has Reading received another library's catalogue on one occasion, but it has also received its own catalogue with the coloured heading used, and in the quantities required, by Southampton University.

On-line catalogues represent a rather different set of problems. They revolve around questions of how many records should be presented on the screen at once, and whether the file from which they are produced is structured so that the point of entry can be the start of a sequential scan through the remainder of the file. There are additional problems in terms of the way the terminal reacts or interacts with the user. The further one gets from the conventional catalogue to which readers have become conditioned, the more need there is to explain exactly what a reader has to do; and with an interactive system this becomes possible in a way that printed instructions do not allow. A full set of instructions and explanations can be displayed to assist in the accomplishment of the next stage. However, the advantage of printed instructions is that they can be ignored by the regular users familiar with the system. Such users (and staff) will become irritated if the system continues to give them very basic instruction. There are two ways round this: one is to keep the operation at the level for a reasonably sophisticated user, but to offer a 'help' facility on the entry of a specific code (often '?' ); the other is to allow the user initially to select a level of sophistication (like selecting a level of play on a computerized chess player). While both systems can be run from a central machine, either can perhaps be more easily worked through an intelligent terminal, which stores the various possible prompts and explanations, and ensures that the central processor receives only the final messages, always in the same form.
Automating library procedures

Even when an on-line catalogue is available, there is much to be said for having some sort of hard-copy output also. Systems do break down, and at such times a catalogue — even if three months out of date — which can still be consulted will enable readers to continue their work. Sussex University intend to produce a fiche catalogue at quarterly intervals for just such occasions, even though their computer has proved hitherto very reliable. To be put in the situation of saying ‘I'm sorry, the computer isn't working; we can't find you any book bought in the last ten years’ is not going to ease claims that further automation will increase the efficiency of the library. Equally, although such developments as campus packet switched networks may enable computer users in a university to access an on-line catalogue, this is for some time likely to be a minority of users compared to the number who have access to a fiche reader. In a public library system, the provision of microfiche for outlying branches may be a more economic proposition than the installation of a VDU and the necessary telecommunications links; there is no practical alternative for mobile libraries.

Whichever form of output is used, but particularly if the form chosen is COM or on-line, questions of layout and entry-length are important. Layout is something which might seem to be fairly standard, at least on catalogue cards, but changes of medium do allow for new possibilities and show up problems with old forms. Linda Reynolds has done a major study on this aspect, which should be compulsory reading for all those engaged in the design of new catalogues. Entry length is very closely related to this, for the difficulties of microfiche catalogues often result from the amount of detail which librarians try to put into a single record. Much of this detail is not, in fact, required by the majority of users, as experience with GEAC, for example, shows. The question of detail in catalogue entries has recently been very thoroughly covered in the report from the Bath Centre for Catalogue Research already referred to. For on-line catalogues it is possible to have a two-stage process, by which further detail can be obtained if required by expanding a record.

I have on a number of occasions mentioned the possibility of starting a separate catalogue as one starts a computerized
system. Where headings in the new system will be incompatible with the existing catalogue this is the most economic method in terms of staff time. The attempt at Reading University to avoid starting a separate catalogue provides a salutary lesson here. One of the factors which influenced the choice of SWALCAP as a system was the lack of any centralized control over the form of heading; this was felt useful in that it would allow the catalogue to continue under 1908 rules. It was soon realized that such a decision would involve the amendment of large numbers of records received from the MARC tapes and from other libraries, removing a basic saving of the system, so the decision was taken to adopt AACR. The decision to keep a single catalogue was not, however, rescinded, and where conflict arose the headings for all items in the catalogue were altered to AACR and latterly AACR2. Sometimes an attempt was made to be consistent: records were moved from place names to 'University of . . .' for all places in which cataloguers could remember that universities existed. Other features were covered only as they arose: it is therefore impossible to say, for example, under which half of a double-barrelled name an entry will be found. Tracings on cards were not altered when the moved heading was an added entry; and often for reasons of time the headings themselves were not altered if part of a long sequence, thus confusing catalogue users still further.

After three years, a fiche catalogue of those entries on the computer appeared, and readers were finally forced to use two different catalogues. The education library, profiting from this experience, had started a new catalogue as soon as it computerized, even though in the first few weeks there were less than 500 entries. On production of the fiche catalogue, this second card catalogue was scrapped, effecting a saving in space also. In retrospect, if a single catalogue was regarded as essential in the main library it would have been better to make manual changes on the computer-produced cards to file them in the existing sequence, leaving the new headings to appear in the fiche.

As to the disadvantages to readers of having to use two catalogues, I do not underrate the annoyance this can cause. It is important to set readers a clear pattern of searching the
catalogues which leads them to try the microfiche first, as being the most up-to-date; this is particularly true of subject searching. For many purposes, the most recent books will in fact be the most important. I am not (I hope) falling into the fallacy of assuming that books are automatically out-of-date after a number of years, but in a number of cases books more than ten years old will be the concern of some (but not all) postgraduates, and of those academic staff carrying out in-depth research; they will not form part of the bulk use of the library, which is undergraduate use. After all, a library of some 150,000 titles must make a reasonable working library for a medium-sized university; and in all but the most specialist of subjects a student is going to find within such a collection as many books as he can actually read. Yet this represents only ten years’ intake of a library such as that of Reading University. It is arguable therefore that in six years’ time a large number of users will be satisfied by consultations of the fiche catalogue alone; and that their task will have been simplified by giving them a smaller catalogue to consult. This may point towards the answer to a vexed question of computerized catalogues growing ever larger and more costly to process: an optimum period for a particular library may be established after which there is an annual cumulation of all records older than this optimum, and a continuing more frequent update of newer material.

Another answer to the problem of consultation of two catalogues is the recataloguing of existing stock onto the computer system. This has been managed in the case of some polytechnic libraries, smaller university libraries and public libraries with a high percentage of withdrawals. It is more of a problem in a large university or public library with several hundred thousand books without computer records. One partial answer is to make records for the most used items of stock, using the circulation records as an indication. A variant of this is in use at Reading University, where an attempt is being made to catalogue the Short Loan Collection and all the other copies of the titles in it; the theory being that this should represent the stock in heaviest use. Unfortunately staff cuts have all but stopped this programme. A second and fuller answer is to use the records of a large library which has
managed the conversion, or a large commercially available database. The obvious choice is REMARC, which is intended for just this purpose. Edinburgh University is about to attempt such a conversion, using Manpower Services Commission staff.\footnote{29}

Another solution has been sought in a form of optical character recognition (OCR). This is really only feasible where a library has a largely printed catalogue with a limited number of typefaces, or a very high quality of typed cards. Handwritten cards present too many problems. The largest case of this to date is the conversion of the British Library Reference Division catalogue — the old British Museum Catalogue of Printed Books, a highly expensive project expected to take at least six years. As well as the reading of the entries, there has to be a suite of programs for adding basic MARC coding, and a very intensive editing procedure.\footnote{30} one can perhaps be forgiven for feeling that the description of what is to be done is a little optimistic. At the end the database which is produced will have two major drawbacks which will lessen its value to any other library attempting retrospective cataloguing: each added entry will form a separate record, with no automatic connection between them, and the headings will continue to follow BM rules rather than AACR2. A similar operation is also being undertaken in Glasgow University Library.\footnote{31}

Some of the developments currently taking place in methods of access may affect the feasibility of conversion schemes. Where it is necessary to check classifications or subject headings for older material in the catalogue, the work of conversion requires not just time but also professional skill. If, however, the use of keyword access on-line obviates the problem of formal subject analysis, the majority of books can perhaps be dealt with by clerical staff, and only those lacking descriptive titles passed to professionals for attention.

Finally it remains to be said of cataloguing as well as of acquisitions that there are inevitably going to be some areas in which traditional checks are lost. It was noticeable at Reading that a number of mistakes were picked up as the cards were filed — it was a stage at which every entry was at least glanced at. This has been lost with the introduction of
the microfiche catalogue. Cataloguers now look fairly thoroughly through the weekly accessions list, but this only contains an abbreviated version of the main entry. Certain other errors which were invisible to the card catalogue have to be checked on each new issue of the fiche — the first frame, to find entries where initial 'O' has been entered as zero, or the 'Great Britain' sequence to check that there is not a second sequence resulting from someone coding it as a corporate, not government, body. Overall, however, it has to be accepted that some errors causing misfiling and hence lost records will have crept in. All users of the catalogue — staff and readers — are asked to note and report any sequence which appears odd, but ultimately the system rests on the faith that ten books catalogued with one misplaced record is better than seven books catalogued — the increased productivity more than compensates for the small degree of error. It is worth making an occasional sample of the catalogue to check that the degree of error is, indeed, marginal. This is yet another of those areas in which an on-line, non-sequential catalogue is less vulnerable than hard-copy output.

This chapter has been concerned with methods of information retrieval at different levels (local and national), and in a later chapter I shall discuss the relationship of these levels. This, however, is perhaps the best place for a confession and a warning. The confession: I am a trained librarian, to whom the catalogue is not a mystery; I have a copy of our microfiche catalogue, and a reader, in my office, together with a terminal giving access to our on-line short-entry file; I have the authority to use some of the library budget for on-line searching. Yet when writing my evening classes on the pagan Celts, I am likely to go to the appropriate shelves to find a suitable book or two. That is at least as much as I have time to read, and I am not looking for an absolutely comprehensive coverage of the subject, just sufficient information for a two-hour class. The warning: the success of an information retrieval system, local or international, should not be measured by the number of references obtained — the worst system will probably produce more material than the reader can cope with. Quality — i.e. relevance — is a more important, and rather less measurable, criterion. Exhaustive retrieval
has a place for lawyers, some medical practitioners and patent searchers — but these are special cases apart from the normal run of library services.

References

4. Revill, Don 'The subject approach: the library manager, the user and psychology'. Paper presented at the Library Association Cataloguing and Indexing Group Residential Seminar, April 1983.
5. Chan, Graham 'Keyword catalogues at Liverpool Polytechnic'. *Catalogue and index* 69 Summer 1983. 5-8; Graham, T W, Lane, R and Richards, K M 'Keyword and Boolean searching on GEAC at Hull University'. *Vine* 48 May 1983. 3-7; Young, Bob, in MARC Users' Group *Newsletter* 84 (1) February 1984. 40-50.

15. Ashford, John H 'Storage and retrieval of bibliographic records: a comparison of database management system (DBMS) and free text approaches'. Program 18 (1) January 1984. 16-45.


18. 'Databases for books'; report of a one-day seminar, MARC Users' Group Newsletter 83 (2) July 1983. 1-10.

19. 'BL to break through the hit-rate barrier'. Library Association record 85 (4) April 1983. 141.


As well as considering which areas of a library are proper candidates for computerization, it is also important to decide within what sort of framework this should be done. There are in turn two aspects to this: the administrative or organizational, which is covered in this chapter, and the conceptual, related to how the system is expected to develop, which is discussed in the following chapter. Broadly speaking, the organizational options are: to go it alone, designing and programming your own system; or to take a package produced by someone else. The latter option may be subdivided into taking a commercially-produced package and joining a co-operative. Not all these options are yet available for every possible library application, and the present or near-future applications offered may in the end prove a ruling factor for reasons discussed in the next chapter.

Given a completely free hand with resources, a home-developed system is most likely to match the requirements of an individual library. One inherent danger has been mentioned in earlier chapters, namely that without a need to fit into anyone else's framework there may be a tendency to computerize an existing system. This can be avoided if some real thought goes into the question of what is wanted. Here the employment of an outside systems analyst or consultant may prove useful, both in questioning what is suggested as a
system, and in seeing where a computer may achieve a similar end result by another means. It is important that any such outsider is familiar with the workings of a library, or is at least prepared to listen to what librarians have to say. Systems analysts in particular have a tendency to look for efficiencies which may in fact conflict with service to the users — concentration of a particular operation at one place when the staff who perform it need to be scattered to deal with readers' queries is a typical case. Librarians can suffer from similar preconceptions, which prevent their taking full advantage of the potential of a computer: they may wish to see all aspects of cataloguing completed before the record is made public, whereas it may be to the advantage of readers that a half-finished record is made public at an earlier stage. Even the most sympathetic of systems analysts can nod: I recall the director of a major library co-operative enquiring whether an acquisitions system with author, title and author-title acronym access and ISBN, BNB number and LC number access really needed access by order number.

However, although all libraries are different they run on the same general principles; indeed, where their intention is to use shared data such as MARC cataloguing records their differences may in any case have to be reconciled. It is worth asking whether a library is really unique, or whether that is just how it likes to think of itself. The important thing is to concentrate on purposes and not processes — does it provide the right information and control, rather than how it achieves this. There are many systems which are already being used for many functions in libraries of widely different sorts, and which are tried and tested and found to be at least adequate if not perfect. They range from fairly specific functional systems, such as the Plessy circulation system or Blackwell's BOOKLINE/AMBER order and accounts system, through packages which have expanded from one function to others — GEAC with its bibliographic file becoming a mini-catalogue. There are systems with almost complete functional coverage offered in separate but interrelated packages, such as OCLC, and at the most flexible end of the range there are systems for handling data, such as STATUS and CAIRS, which do not care if the data is the author-title-publisher-subject set of a
catalogue or the book-borrower-date due set of an issue system (or indeed a combination of both). The users of these packages range from small, highly specialized research or industrial libraries (many were in fact developed specifically for such operations) to large public and academic libraries.

These packages, like those produced by co-operatives, work; they have to, or no future customers would be found. One danger with writing one's own system is that in the end, after a lot of expensive development, the system either does not work, or works no better than any of the commercial options would have done. The two factors of expertise and time are most important in any in-house development. I have already mentioned the difficulty of explaining library needs to systems staff outside the library, and there usually needs to be at least one person on the library staff who can speak the right language for the design team. The problem is that such bright young men (as they tend to be) can even today find jobs and promotion. So often at seminars descriptions of a particular system end with a phrase such as 'and then he left', and the implication at least that people have been attempting to pick up the pieces ever since. Unless the librarian can afford to employ a number of systems staff so that he can ensure continuity, there is a constant danger of losing touch at a critical moment for development.

Nor is the time-factor to be ignored. Library systems development is not straightforward; starting from scratch, or even from such non-copyright crumbs as can be snapped up, it is a question of years rather than months. As well as increasing the danger of key staff leaving, this means that the librarian has no tangible results to show for a considerable capital investment for some time. Packages exist here and now; there needs to be a very good reason why a new system has to be developed. Furthermore, the time involved may not be totally under the control of the librarian. If it is, he can set his own priorities; if, however, he is using programming expertise from elsewhere within the organization the priorities may differ. It is a sad fact that libraries do not usually command high priorities in terms of corporate goals, and while it is useful to have a library system development to occupy programming staff when things are slack, a new
stock control system for a firm, or a new budgeting system for a council, or the new student records system may well interrupt the library development.

Even if a commitment is made to produce the very basic library systems, the refinements — statistical analyses, on-line access, ad hoc listings — may be held up in the pipeline for a number of years. Indeed, the full system as originally envisaged may never get written because of other calls on the time of design or programming staff. As for the continued development of the system, this may at best take place only when the programming staff are short of work, and at worst may not even be paid lip-service. Yet systems grow out-of-date; equipment becomes obsolete; and a library can find itself faced with the imminent death of its system with no replacement in sight.

Equipment can be another problem for the home-designed system. There may be problems for a large library in providing accommodation for suitable computing hardware, with all its attendant air-conditioning and 'clean' power supplies. This can affect the acquisition of a commercial package also. More dangerous, however, is the offer to let the library share a machine bought for other purposes but running at less than capacity. The question of priorities can arise in connection with the hardware as well as the programming: what happens when the library system starts to grow, or when the same happens to the other systems on the computer? Libraries often require both scheduled and irregular processing runs — the former to update circulation or catalogue files, the latter perhaps to obtain statistics or lists of individuals' borrowings. While the former should have been accommodated in the design, the latter could prove a strain on the operational flexibility of the system — particularly if library processing takes a low priority. Even the regular runs may be affected by machine failures, and there needs to be very clear agreement about what happens in such cases.

If it is intended to use a computer outside the library, it is important to know how long it is anticipated that it will remain in service. Within seven to ten years a machine is usually obsolete, and while it may continue to function, spares and maintenance can prove ever-increasing problems,
and downtime consequently a major difficulty. If it is likely that a machine will be changed in the next two to three years, it is vital to find out what sort of machine is likely to replace it. Unless it is of the same ‘family’ of computers, programs will require re-writing — again the library’s may be well down the list. Worse, the machine may not have the capacity for library work. Reading University ran its offline ALS system on the computer centre’s ICL 1904T, which also coped at that time with the administrative computing. A new machine was purchased to run the finance and student/staff records systems, with no spare capacity for the library (whose programs would, in any case, have required re-writing). As the 1904 neared replacement, it became clear that what the university as a whole required were smaller machines to cope with the teaching and research needs. Moreover, the UGC had made it clear that research computers were financed for research work, and not to facilitate administrative operations. It therefore became imperative for the library to start again. In this particular case the existing ALS machinery was also breaking down, and had lasted over ten years, so the change was scarcely unexpected; it would have been disastrous had the system only recently been introduced.

Running a library system on someone else’s spare capacity brings with it additional political problems if it is at any stage desired to change to a dedicated system. These relate to the problem of real and apparent costs; library computing may be getting a ‘hidden’ subsidy. Thus in the conversion from the ALS circulation system run on the university’s computer to the SWALCAP system at Reading it was estimated that the ALS system was costing the library budget £2,500 pa; the SWALCAP system was likely to cost £20,000 pa. Even had the library opted for a commercial package run on an in-house computer, the cost would have been similar by the time the capital cost was spread over a number of years (with interest charges) and maintenance costs had been taken into account. Fortunately the data processing officer was able to show that in reality the existing system was using about £15,000 worth of computer and operator time, for which no charge was being made. This sort of problem is less likely to occur in industry, where the computer department
is likely to recharge the full cost of the service to user departments, but it is common in academic and public bodies. Before a librarian 'sells' a system to his committee on the grounds that it is very cheap because it will use spare capacity on an existing computer, he should perhaps give a thought to the possible future problem he is storing up for himself or a successor.

When it comes to purchasing a system, the choice must be made between straightforward commercial systems and the services offered by co-operatives. It may be asked what is the difference between two types of service both of which are aiming to make a profit — even if, in the case of co-operatives, it is only to be ploughed back into further services. To some extent I suspect that the difference is one of the degree of control libraries feel they have over the operations and development of the organization; I stress feel, since it is more a subjective perception than a definite fact. Thus OCLC appears in the British market, at least, more as a commercial supplier than the co-operative as which it started life. BLCMP is perhaps moving in the same direction; possibly SWALCAP will reach this point if and when it establishes itself as a company. The addition of 'Incorporated' or 'Limited' seems to turn a co-operative into an entity with a life of its own, and correspondingly to reduce the significance of the members who once felt themselves essential to its very existence.

If there is any real difference between a co-operative and a commercial undertaking it must lie in the matter of sharing. The degree of sharing, and indeed what is shared, will vary from co-operative to co-operative, but all of them work on a basis of pooled data at the very least. They also work on the principle of sharing development and other costs between the members. So, of course, do commercial firms, but they do not have a guaranteed market. It is much easier for a co-operative to price the development when it knows roughly how many of its systems it will 'sell'; introducing extra members will then enable it to maintain its prices for back-up at a constant level despite inflation. Obviously there are boundaries within which prices must be kept — no member library will take a new service if its price is totally unreasonable.
Nevertheless, this is a very different position from a commercial firm which must make its initial investment without any guarantee of return, and must attempt to set a price which will attract sufficient customers to make that price viable.

It is largely on shared data, however, that co-operatives attempt to sell themselves. Perhaps this is because so many of them operate primarily in the area of cataloguing and acquisitions, where data can be shared more easily than in circulation. The size of the database will be emphasized in any publicity, the degree of overlap within it minimized. Shared data can certainly reduce the costs of library operations in the area of cataloguing,\(^1\) while for acquisitions purposes access to a large database may increase the chances of finding an existing record for a book it is desired to order. There is a value to shared data in other areas also — I have mentioned the pooling of information on the actual publication date of irregular serials in PERLINE (although it should be noted that this is very definitely not a co-operative). Shared data might also assist inter-library loans services, although as mentioned this has not yet happened in this country outside the context of LASER. The OCLC database is used for interlending in the United States, and the shared use of the GEAC system within London University (an interesting example of co-operative use of a commercial installation) may well enable libraries to direct readers in urgent need of a book to a library where it is accessible on the shelves.

The network which is part of a co-operative may also have uses for the purposes of electronic mail. However, this is by no means universally true: SWALCAP’s network is useless for messages other than from the centre to the members. Equally, PERLINE has electronic mail capability. More important, facilities such as HERMES will make this function easier to find outside the context of library housekeeping systems. Indeed, expected developments may widen access to a number of benefits presently available only through co-operatives. Chief among these must be the development of Local Area Networks (LANs) and Packet Switched Systems (PSS) for telecommunications, and the possible development of UKLDS. The former will increase the potential for
computer to computer connection for access to other libraries' databases, and indeed for sharing and pooling processing power. Experiments are currently taking place on networking in libraries and the possibilities it opens up; networking outside libraries on a less centralized basis than through existing co-operatives is an obvious development from this.

The existence of UKLDS could radically transform the cataloguing and acquisitions picture — and the inter-lending one also, if the BLLD union catalogues are made available this way. A national database accessible to anyone with a modem and a processor capable of accepting records in MARC format would take from the co-operatives their present monopoly of large databases of records; shared cataloguing would be available — at a price — even to those who did not wish to share their own creations. Indeed, whether or not UKLDS ever becomes a reality, access to such databases for those who do not wish to take the other services of a co-operative are already in existence. OCLC Inc has started its Selected Record Service; other co-operatives are likely to follow suit. As a result, members of co-operatives will need to find benefits apart from the shared database to make this form of organization attractive.

One other benefit in the past has been shared hardware; traditionally libraries in co-operatives have only had to run at most a minicomputer locally, using a mainframe computer at the central site for all the major processing. This was a solution well tailored to cataloguing systems in which the output was normally frequent updates of COM microfiche catalogues. Interestingly only SWALCAP runs a circulation system based on a central rather than a local processor, and it would be true to say that this has at times caused problems when, for reasons of failed telecommunications or machine downtime at the central site, the central facilities have been unavailable. As the other co-operatives — BLCMP and OCLC — have moved into the field of circulation systems they have decentralized, designing stand-alone systems such as CIRCO and LS2000. SWALCAP is now planning development in the same direction, prompted (as are the others in part) by the demand for on-line public access catalogues
and integrated systems based on a single bibliographic record.

Nevertheless, there may still be a place for the central site of a co-operative. If libraries wish to retain the ability to produce microfiche catalogues — for back-up purposes when the system is down, or for outlying or mobile libraries for which on-line terminals are uneconomic or impractical — this might involve them in heavy expense in terms of removable disk packs for storing formatted files, or large amounts of processing capacity and core memory for updating and formatting the files. This extra capacity would remain idle for much of the time; far better, perhaps, if it is shared between the members of the co-operative and placed at the central site, where a number of libraries using it infrequently will keep it in fairly constant use. This is even more the case for smaller libraries, whose local requirements may fit comfortably onto the upper end of the microcomputer market but who require facilities to process and format for catalogue output MARC records acquired from a major database. Similarly it may be possible for both security back-up and diagnosis to be carried out by staff in the central site. This may in turn lessen the need for library staff to work after the library has closed or before it opens, taking back-up copies of files, and the need for library staff to acquire detailed systems knowledge to correct problems and faults. This picture is perhaps not very far from that of a network of microcomputers using central disk storage, only of course on a larger scale. The question of the frequency of use of large amounts of core and disk space is one which a library needs to address before deciding that there is still justification for becoming part of a co-operative.

The other potential benefits of membership of a co-operative seem, unfortunately, to remain only potential. There is a general reluctance among librarians in the UK to surrender any aspect of autonomy without a considerable struggle. The creation of a joint database was for many a traumatic exercise, and SWALCAP was built on the foundation of preserving separate catalogue files for each library to allow members to organize their records however they wished. Time is still spent checking and ‘correcting’ — ie putting into
locally preferred form—catalogue records created by other libraries. Joint exercises in retrospective conversion of past stock have as yet found no practical expression even where they have been contemplated. Direct inter-lending between academic libraries—of basic undergraduate texts in heavy demand for two weeks a session, for example—is unthinkable; so, in academic libraries at least, are co-operative acquisition policies. The emphasis is continually on what can be got out of a co-operative, and less attention is paid to what could be put in, to create something greater than the sum of the parts. The expertise of systems staff in a co-operative is rarely regarded as a valuable asset; yet it is possible to draw together a large and efficient team at a minimal cost to individual libraries. The benefits of co-operative automation are there, but may not be easily realized.

The purchase of straightforward commercial systems is another matter again. Whereas there are a limited number of co-operatives, offering in many ways a broadly similar range of services, the commercial computer information-handling packages are comparatively numerous. Attempts are being made to list what exists, and to make some evaluation of them. A glance at some recent surveys gives an indication of the variety of suppliers and levels of operation. Hitherto, at any rate, these systems have been more open to competition than the co-operatives, with all the stimulus that provides for continued development; recently, the co-operatives have begun to realize that they too are operating in the open market. Perhaps the greatest difference in terms of development is that a commercial operation can decide at some point that what follows is a new system, and that while they will continue to support existing customers, any who want to move to the next version will have to find the necessary capital for (perhaps) new data-capture equipment as well as a new computer. In a co-operative development has to be evolutionary if central equipment changes but members wish to retain their terminal equipment. Whether this commitment to making provision for outmoded equipment to operate in the context of a new system will survive the move to stand-alone systems is more doubtful.
There is a halfway position between a commercial system and a self-designed one, and that is a modified commercial system. Here all the basics come from the commercial package, but the library has the little extras added to customize it. This may be done by the supplier, for a price, but perhaps with the thought that the more sophisticated version may also be marketable. On occasions it may be possible to develop the package as a whole as a joint venture between a supplier and a user, as happened with the original ALS system in Derbyshire. In other cases a commercial system is modified by the purchaser using the library’s (or more usually the parent body’s) own programming staff. The John Rylands University Library of Manchester has found the basis of its updated circulation system in the TOBIAS system used in Rotterdam. Sometimes the changes are not so much modifications of the system within the bought package as developments into other areas. Sussex University built cataloguing and acquisitions features into their GEAC circulation system at a time when GEAC themselves had not developed them. The result is an integrated system which has nevertheless cut development time by using a basic commercial package.

Such a system will also reflect very closely the requirements of the purchasing library. Co-operatives are usually fairly limited in their flexibility, at least as regards the fundamentals of the system. How closely the system offered matches the requirements may depend on luck — not just the luck of the system matching up closely, but the luck of the library’s joining just as a modified version of a system is being designed, and therefore being able to feed in its requirements as part of the design process. Where all, or at least a large number, of the members are involved in the design, there is always a danger of ending up with a camel. Usually the choice is between a system which will accommodate all members’ requirements but in doing so needs to check so many files that response-time is badly affected, and one which cuts down the options in certain areas to keep response-times reasonable. The latter course usually results in the better system; in general many of the idiosyncrasies can be dispensed with.
This is particularly true of cataloguing systems, where data are normally being shared in a form common to all, even when separate files are maintained for each library (as in LOCAS or SWALCAP). Moreover, the main variants occur in the production of catalogues — in the format and content of entries — and these are usually run as overnight batch processes; in this case the use of a large set of parameters for each library is still a reasonably economic proposition. Where the entry is available on-line such variation is not possible, and a compromise entry has to be worked out. Compromise may also be necessary in setting a standard for contribution to the system. To some extent this will depend on whether the system has a single file (as does BLCMP) or separate files, although even a single file may accept new entries in a sub-standard form. The problems have been amply documented in the attempt to arrive at a recommended standard for UKLDS. The sort of facilities which the co-operative offers may also affect the possible ways of operating the system in the library — the existence of catalogues on-line or off-line, the necessity or otherwise of receiving print-outs of records. Much of the day-to-day running of the system is out of the control of member libraries, and this can certainly cause difficulties.

With circulation systems the variations between libraries are greater, and consequently more compromise may have to be made. Normally the system is parameter driven to a high degree, but there will still be limitations. SWALCAP allows a library only seven categories of reader — which sounds a lot, but for academic libraries who may wish to differentiate not only levels of reader (academic staff, non-academic staff, undergraduates, postgraduates) but also to separate postgraduates on taught courses leaving in June from those leaving in September, to allow overnight loans only to certain people, to have visitors registered at each branch entitled to borrow only from that branch, and may wish to differentiate between full and part-time students, it often proves insufficient. The problems can be overcome by using ranges of numbers, but this is less accurate and relies upon more staff memory and less automatic processing. Equally niggling is the need often to have a standard, system-wide wording for
notices sent to users (SWALCAP has a variant allowing bilingual notices in English and Welsh). Often the compromise text is unhelpful if only because certain features of nomenclature vary locally — one man’s recall is another man’s overdue. This sort of problem may be even worse when it comes to designing acquisitions systems — the sort of information which libraries want as standard on orders (‘Please send two copies of the invoice’; ‘Please address to . . . ’; ‘Please supply hardback unless otherwise stated’) will differ considerably from library to library.

However, if local modification of package software provides the swiftest route to the system which does exactly what a library wants, it can also be a rapid way to total despair on the part of the staff who have to keep the system running. Once a package has been modified locally the original supplier will not only feel less interest in keeping it running but will also be considerably less able to do so. Equally, however, the bugs may arise in areas of the software about which local systems staff know very little indeed. Caught in the middle of this, with a system crashing before his eyes, the librarian may feel very, very lonely.

This should give some idea of the different sorts of problems to be encountered in the various approaches to computerization. When considering where the balance of advantage lies, the librarian will have four general areas at which he needs to look carefully: the requirements of the library; the likely development; the general support and back-up; and of course the cost. I should like to look briefly at these areas.

Requirements

I have already questioned the uniqueness of any individual library, and considered the degree of flexibility which the various systems provide. There are, of course, distinct differences between types of library, particularly when it comes to circulation. Public libraries usually have a very high volume of loans, all for a standard period; academic libraries may distinguish between categories of book, or categories of reader, or both; special libraries may have relatively few
loans, and these may be for long periods — perhaps for ever — when the managing director appropriates the book for his office. It is unlikely that a system written to be efficient for one of these operations would be geared to the others as well as a system written specifically for them.

There are, however, requirements other than the performance of library routines. One is the whole question of the analysis of the operations, the management information. The point is made by Peter Gratton, in commenting that even had co-operatives existed Derbyshire would not have used them: 'There aren't co-operatives which do what we need. That is to say, none operates as a management tool rather than an operations method'.11 (Fortunately this is less true today.) It was the desire for management information which led Sussex University into the modifications of the GEAC system, but the desire was also for feedback on user operation through logging the type of search made and its degree of success.12 A similar sort of feedback is to be found in the TEAL system.13

Equally as important as management information and feedback on readers' patterns of behaviour is the question of the staffing requirements of the system. This is not just a question of the number of staff saved or not saved by automating various library routines, but also of the operating requirements of a machine. In a co-operative, one member of operations staff may be sufficient to perform the late night routines for all libraries — initiate security runs, run the overdue recall and catalogue update processes and the recreation of indexes, and load and unload the appropriate tapes or disk-packs. When libraries run their own systems it may be necessary for someone on the library staff to stay behind when the library closes to initiate all these processes, change tapes, put the appropriate stationery in the printer, and act as watchdog; equally, they may be carried out automatically with minimal staff intervention. Between these two extremes lies a continuum of staff involvement; at some point on this line there will be a match with what the library can manage.
Development

Library computer systems do not spring to life fully-armed like Athene from the head of Zeus; they start somewhere and add further operations subsequently. Nor do they ever become fully grown; technology advances, new possibilities are seen, and the system lurches forward. It is a process like the movement of an amoeba, bulging forward at one point and waiting for everything else to catch up. Some of the implications of this for the conceptual organization of the system are discussed in the following chapter. Here it is sufficient to say that no system which is chosen should have its development path closed. Even in a small operation which is utilizing a database management system on a microcomputer it may be sensible not to start everything at once, but the prudent will ensure that the system has the capacity to handle such other applications as are foreseeable. With a larger system some thought has to go into the initial structuring of files for one application to enable smooth addition of other applications later. This applies whether the system is written in-house, commercially, or in a co-operative. In the first case the librarian may have sufficient control to stipulate how the files should be structured; in the other two cases he should make fairly searching enquiry as to what developments are intended and how they are to be implemented.

Besides ensuring that the development potential is present, the librarian also needs to be sure that what will be developed are the areas which he sees as priorities. The programme of development can be set by the library in the case of an in-house system. However, the speed at which it is pursued will be dependent on the amount of work the programming and design team have on hand and the priority assigned to the library's needs. If the library has its own systems staff progress can be quite rapid — as at Sussex University. In other places development may remain little more than a pious hope — occasionally a reason for doing nothing about failing manual systems. A commercial supplier will develop those applications which seem most easily marketable. Here the pressure of a user-group is valuable, for if libraries using
the system are seen to be pressing for development in a particular direction they are likely to provide a basic market for the finished product. However, a firm will also have its eye on the as yet untapped market, and if it seems that some other area of development will provide a better source of income, or will show a better return on the amount of investment, that is likely to take priority.

In a co-operative, unless it has cut itself off completely from its membership and the elected members of the board are from totally unrepresentative libraries, one should have the best of both worlds: a sufficiently large development team to avoid the problems of developing an in-house system, but development clearly under the direction of the users, who are all libraries. Therefore although a particular library may lose out in that it alone of the members has a desperate need for a periodicals management system, say, overall the development will be in the direction the membership as a whole wants. A co-operative is not normally looking for financial return on the development investment, but the less tangible return of an improved system and therefore savings in costs or staff time for the members. Two features can nevertheless blunt this ideal. One is the size of the development team. Because straightforward financial gain for the co-operative is not sought, and because even covering costs is going to mean increased payments in some way from the members who also form the board, these costs are kept to an absolute minimum — which may, in fact, be below the minimum which is really viable. This has been a problem for virtually all the British co-operatives. Too small a development team may mean that the timescale for a development is too great for it to be worthwhile, because by the time it is developed the equipment on which it is to be run will be due for replacement. Often, in fact, it is the purchase of new equipment which acts as the spur to developing new applications. The other feature is that although in theory the members, through the board, settle the direction of development, the director of a co-operative will have a great deal of influence if only in pointing out what is or is not technically possible.

The need to delay development of extra applications until
new hardware with greater potentialities is available will affect in-house and commercial development also. Frequently the thought of completely re-writing a whole suite of programs for a new computer can be daunting for a small team, whether inside or outside the library. It is interesting how few totally in-house second generation systems there have been. The University of Southampton Library, for example, one of the pioneers of automated systems, has looked to a co-operative for its new system, while the John Rylands University Library of Manchester is basing its new circulation system on a system already in use elsewhere. However, since in this latter case they can modify the system to their own requirements they are at least able to retain the same basic data-capture system, and to avoid the enormous cost of re-labelling all their stock.

This may not be possible when moving from a commercial system to an upgraded version, even one produced by the same supplier. This is particularly important in the case of data capture equipment for circulation systems, where the costs and time of replacement are very great, but it can affect other areas — a new system may be MARC-based whereas a previous one was not — and could extend as far as the sort of terminal equipment. The only constraint on a commercial supplier is the likelihood of selling the upgraded version to libraries taking the present system — if the cost is too great libraries will not change.

Support and back-up

I have already mentioned some of the implications in staffing terms of security runs, and the ways in which these can differ in co-operatives and stand-alone situations. The two may not be in direct conflict: one option being discussed in SWALCAP is that the security back-up should be done by a process of file-transfer to the central site even for libraries running the whole system on a local computer. Without some such central site, the options other than intensive use of staff at overtime or shiftwork rates are timer-controlled systems as at the Polytechnic of the South Bank,\textsuperscript{14} or the use of two machines in parallel, as originally proposed in Derbyshire.\textsuperscript{15}
This latter course is naturally very expensive, and has been developed in industry rather than in libraries.

However, more important to the user library than just the existence of a security copy of the data is the degree of assistance which can be expected when a fault occurs, particularly one related to the programming. Just as hardware has faults, so software has ‘bugs’ — oddities which mean it does not behave as it should or as is expected. When this happens somebody has to sort out what has gone wrong and do something about it; in the initial stages this may involve trying to discover whether the fault really is in the software or the hardware. (A nice case recently was the tendency for the selection of certain transactions at Reading — eg renewals — to shut the system down momentarily. No explanation has been forthcoming, but we think it is a fault of computer memory and thus hardware rather than software.) If the software is to blame, the more familiar someone is with it the simpler it is to track down the problem. The original designer is therefore perhaps best placed to realize what area of the program has failed, and to put it right. Thus the home-grown system can have an edge over others.

Not always, however, for as I have noted computer specialists tend to move and then the users of a home-grown system are forced back entirely on their own resources. A co-operative is normally, of course, a home-grown system, but it is to be hoped that there will normally be a sufficiently large staff to ensure some continuity; thus that particular disaster is avoided, although it is true that the finding of solutions may be slowed because no one left was on the original design team. This may be the case with commercial systems also, the designers of which may have moved to other firms, to other tasks within the same firm, to retirement, or to the great database in the sky. Commercial systems modified by the user present, as I have said, particular problems akin to equipment maintained by two firms — each wants the other’s part to be at fault, neither is totally familiar with the system. Both commercial suppliers and the central staff of co-operatives have their problems in tracking down problems; for the end-user, however, the existence of expert help is one of the advantages to be gained from
adopting one of these approaches. Most commercial suppliers run some sort of help desk, and most purchases of commercial software include software maintenance contracts. These not only pay for the facilities of available advice, but also entitle the purchaser to the time required to sort out specific bugs, and to revised versions of the software. This latter point is extremely important, for when a problem is found in a program and a modification is made in consequence, it is naturally pointless for every user to wait until they experience the same problem before having the program modified. Programs may in fact, go through several issues before they are replaced by something better. What software maintenance charges do not cover normally are enhancements to the program which really make it bigger and better. There is a very fine line to draw between what improves the program and what merely makes it do what its vendors always said it did.

Essential to the tracing of problems is good documentation of the system. Full specifications (in intelligible language); flowcharts; block diagrams; manuals — all these should exist, together with evidence that they are kept up-to-date. The existence of these is some guarantee that the supplier is willing and able to fulfil his obligations in terms of support. The librarian should ensure that a similar standard of documentation will be forthcoming for any locally-designed system.

One area in which the user of a ‘home-grown’ system must inevitably lose out is in the lack of a peer-group from whom help can be obtained. Whether this group is composed of fellow members of a co-operative or is the user-group of a commercial package, it provides a forum for the pooling of experience and the discussion of possible solutions — be they modifications of software or changes in the pattern of library operation — to problems which have arisen. It provides also a pressure-group pushing for essential modifications to the software, which is valuable in a co-operative as much as in a package operation. Moreover, on the ‘two heads are better than one’ principle, there is less likelihood of some aspect or implication being overlooked when subjected to comment from a number of differing viewpoints. Finally, but by no means to be disregarded, is the psychological comfort of
knowing that one is not alone. The librarian deciding to write a system locally must be prepared to lose this support, while anyone contemplating the purchase of a package, whether produced by a co-operative or a commercial supplier, would be well-advised to check that at the very least an informal group of users exists.

Costs

Perhaps this is the only rival to matching the library’s requirements when it comes to reasons for choosing one approach rather than another. Financial pressures on libraries are today so great that often something which is really only second best is taken because it is cheaper — at least in the short term. (It is a sad fact that library budgets, and even those of parent authorities in the public sector, rarely make provision for investment now in order to save later.) The cheapest option in terms of actual cash-flow may be the in-house solution using a computer already in existence.¹⁶ I have pointed out above that the low cost of such a system is essentially false, and may raise unjustified expectations about the costs of computerization generally; nevertheless, in terms of the actual sums which may have to be found from the library’s budget it is a very attractive proposition indeed. It will have clear attractions from the parent organization’s viewpoint also, since it will be utilizing staff who might otherwise have been underemployed while the library contributed to the cost of similar staff in other organizations.

The purchase of a dedicated computer, whether to run an in-house or commercial system, is inevitably expensive. Even a microcomputer, at between £5,000 and £15,000, may be a good proportion of the budget of the sort of library that can fit its requirements onto a machine of this size. Where the costs are in the region of ten times that amount, even the largest of libraries is going to have some difficulty — not just financial difficulty but also political, if at the same time they are having to cut book-budgets, or cancel periodicals. It may be possible to purchase the equipment on a lease — which incidentally goes some way to solve the problem of the lack of depreciation accounting in academic or public libraries.
Sometimes, however, it is easier to obtain a lump sum than to persuade people to commit funds over six or seven years. Some commitment will in any case have to be made for maintenance contracts.

Some of the choices suggested in other areas carry cost implications, and will need careful study to determine the balance of advantage. For example, back-up security run by copying from disk to disk is economic of staff time but expensive in terms of disk storage; the decision on its use may in the end be made on the basis of whether recurrent or capital finance is easier to obtain. The close matching of requirements in terms of library routines is another area which is closely related to costs: a co-operative might, for example, offer an excellent service and a well-designed, efficient, highly flexible circulation system. The flexibility will, however, involve system overheads in terms of the necessary size of machine which lessen its attraction to a public library running a simple issue system; why should they pay for something they will not use? Against this, there are obvious potential cost advantages in the sharing of hardware and staff within a co-operative, in that the peak demand on either may not be the sum of the peak demands in individual libraries, if the load is spread. (There is a danger in a co-operative like SWALCAP, with a membership almost entirely composed of academic libraries, that there will be no such spreading — terms all start at about the same time — and that therefore the savings in this area may be less than anticipated.)

An added attraction of the purchase of a dedicated machine is that the sums involved are fairly set and therefore budgetable. A lease involves a fixed level of payment; maintenance costs vary with inflation, but can be reasonably well estimated in advance. The problem is slightly greater if the system is growing in size, since maintenance agreements also increase with the amount of equipment covered; this again is usually predictable, since the capital cost of the extra equipment will have to be budgeted for in advance anyway. There are no varying running costs other than the normal allowance for inflation in fuel prices and operators’ salaries; and computers need not be greedy of power nor consuming of operators’ time, if the systems are well designed. Only if the
installation is so large that it has high air-conditioning costs do these overheads make a significant contribution to the overall expense; and again they are predictable.

In contrast, any system in which the cost of the use of a computer is being shared between a number of users, be it a bureau machine, the central processor of a co-operative, or an in-house machine on which time is charged, will have costs which are difficult to predict. Although estimates can be made from statistics of the previous manual operations, translating these into the number of computer transactions they might represent, there is always the unpredictable factor of how use will change once computerization is introduced. Certain enquiries previously made of print-out or a manual file may now be made on-line, at a finite cost per enquiry. If catalogue records are available on-line, people will look at them. If a new terminal is added, the use of the system (and thus the cost) is likely to increase; allowing two terminals for access by the public at Reading University increased the transaction costs by £2,000 pa. Or it could have done; but a further element comes in, which may be an attempt to make life more predictable but in many cases has the opposite effect. A number of systems base charges on the peak week during the year, on the grounds that they have to provide a capacity for these peaks. If one can accurately predict which will be the peak use, and at about what level it will be, then it becomes much easier to estimate costs in advance. However, one always runs the risk that an unpredicted burst of use (a sudden drive to get rid of a cataloguing backlog, for example) will create a new peak and throw the budget into disarray. It is therefore much more difficult to control expenditure in a co-operative than in other approaches. Cost was the first disadvantage of a co-operative put forward in the assessment of options at the Polytechnic of the South Bank. 17

It should always be borne in mind that once computerization has been undertaken the costs are likely to escalate. More areas of the service will be computerized, and more and better possibilities for systems will be seen. Reading University joined SWALCAP for cataloguing purposes in session 1979-80, and made a capital investment of £12,000; running
costs of £5600 were put into that session's budget. In 1983-84 the budgeted running costs were £45,000, together with maintenance costs of £10,000; in the intervening five years over £20,000 of capital equipment had been added. Now the library is contemplating the need for between £150,000 and £180,000 for suitable computing equipment on which to run an on-line catalogue locally; if this were done, further terminal equipment would need to be purchased at a cost of perhaps a minimum of £15,000. Running costs might fall, but maintenance costs would soar. Undoubtedly there is a danger of systems development squeezing both staffing and stock budget into non-existence.

While looking into costs and charging schemes, a librarian must also satisfy himself that the organization he is intending to use is financially viable; there is no point in joining a bankrupt firm. In the case of a 'home-grown' system this scarcely matters; if the parent company or institution goes to the wall the library will hardly remain a viable unit. All other ventures involve a degree of risk, and an element of guesswork or gambling must enter into the selection, but track records for producing systems on time in the past, and at prices which attract purchasers can be inspected and evaluated. On this basis the co-operatives would not always appear to have been unquestionably successful. One problem in such an investigation is rapidly being removed: the speed with which co-operatives are turning themselves into companies means that financial information about them is now much more publicly available.

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These then are the areas of decision and the factors which a librarian will have to consider in making the decision to go it alone, purchase a package, or join a co-operative. The next chapter considers the conceptual approach, and the two have a chicken and egg relationship in the ultimate choice according to the weight put on them: the decision to join a co-operative may provide a definite framework to the way the computer is to be used, but equally strong feelings on this point may rule out the use of certain systems.
References

1. Davis, R J 'The availability of MARC records for cataloguing'.
5. Lovecy, Ian 'What's in co-operatives for me?'. Catalogue & index
   162-3.
7. Leeves, Juliet 'Survey of automated issue systems in public libraries'.
   Vine 52 December 1983; Program 16 (3) July 1982 (special issue
   on software packages for information retrieval).
8. Gratton, P D Automation in Derbyshire County Libraries. London,
   1983. 15.
11. Gratton op cit. 16.
12. Young, Bob, MARC Users' Group Newsletter 84 (1) February
14. Hawes, D F W and Botten, D A Library automation at the Poly-
15. Gratton op cit. 22.
Librarians have set up a number of internal boundaries within their operations: acquisitions, cataloguing, circulation, information retrieval, reference work, inter-library loans to name but some. Each of these tends to be a separate area in library thinking, however much the positions of these boundaries may vary from place to place. Even in libraries where most, if not all, of these functions are lumped together as ‘technical services’ staff frequently identify themselves with a specific process – ‘I am a cataloguer’. In one sense these boundaries are real; the skills of a good acquisitions librarian lie in prising books out of booksellers, not in assigning accurate and helpful classification numbers. These are not, however, separate jobs; they are different aspects of a single task, the provision of information to readers.

The strong separation in a number of libraries is in large measure the result of the limitation of manual systems. Because it is too costly to duplicate the complete file of books on order, just arrived and fully accepted into the library, for example, it is broken into a number of subsets (orders, awaiting cataloguing, the catalogue). The most active files, for ease and cheapness of maintenance, have minimal access points. The addition of progressively more data as the book passes through various processes involves the re-creation of the record if it is not to appear very messy and difficult to
decipher; thus cards are discarded and new versions typed at various points in the progress of a book through the system. The time taken for the production of cards and their manual filing often leads to the creation of temporary files to cover an interim gap. The result is a considerable degree of duplication and waste.

Let me illustrate the problem from current discussions taking place in Reading University Library; I stress that these are taking place, and have not yet resulted in solutions. The background is a library with automated cataloguing and circulation both obtained through SWALCAP and with certain connections between the two systems. Certain elements of an acquisitions system are also available, and one factor prompting the rethinking is the need to decide how we should like the acquisitions system to work — in terms both of computer systems and library operations. Physical reorganization of the library because of the construction of an extension has been an added stimulus to change our methods. At present the records of a book which exist are:

1. The original order (typed); accessible by order number. The details are probably as originally written, although occasionally misspellings of authors may have been corrected. The record will contain author, title, publisher, date, supplier, ordering department, and possibly price information; recent orders will probably include ISBN if it was known at the time of order.

2. The accessions record (hand-written and ultimately bound); accessible by accession number and less rapidly by date of arrival. The record will contain accession number, order number, brief details of author and title, supplier, invoice number, price.

3. Accounts records. These contain invoice date, supplier, price, and main account number to which the invoice was charged in one record; accession number, price of book and ordering department in another record. The access points are date and ordering department. The two records are being amalgamated with the addition of order number; access will be by order number, supplier, fund to be charged, and accession number.
4. The catalogue record — access off-line by author, title, other added entry, subject; on-line by ISBN or other control number, and author-title, title, or author acro-
ynm.

5. The circulation record — access on-line by accession number, heading (personal author or title but not both), location. Access (off-line) by editor and corporate author soon to be available. (I have ignored listings which can be obtained by a wide range of selection keys related to the circulation status and history of the book.)

Two things stand out immediately: the repetition of certain data elements in two or more records, and the somewhat incredible number of different records for a volume. Clearly some of these exist to provide specific access points to certain data, and to avoid the need for someone to rush from one source to another to find the data required. Equally elements not present when the procedures were established render some of these unnecessary. For example, the earlier issue system was based solely on the accession number and had no bibliographic back-up file; access to a bibliographic description via the accessions register was thus extremely important. The utility of a continuous accessions register is now called in question, since the data it would contain may be found, from the same access point (accession number), in either the circulation system or the accounts system. Whether the two aspects, the bibliographic information and the order history, are ever required together we doubt. If so, it means two consultations, but as the appropriate terminals are opposite each other this is scarcely a problem. Certainly it does not justify the time spent writing out an entry in the accessions register.

However, it does suggest lines of development. The data at present entered into our independent accounts system could also be put into the MARC record; the two sets of information, bibliographic and order, would then exist together again. This would be a logical step if the original order were to be produced from a MARC record — the record called up to check that the book supplied was the one ordered would be the record into which details of invoice,
price, etc, were input while the basic descriptive record would exist (as a MARC record or from the order information) and could be amended if necessary at this time. The processes of accessioning, accounts entry and descriptive cataloguing might thus be accomplished in a single operation at a terminal. Moreover, records for books fully catalogued, on order, or in between — descriptively catalogued but awaiting subject cataloguing (and possible upgrading of the descriptive work) — would all exist in a single file, thus simplifying the work of pre-order checking. In principle this seems a highly desirable way of operating (in practice we have some reservations about the amount of work to be done at one time). Two major deficiencies, other than the lack of an order element in the computer system, currently stand in the way; the inability to strip off the accounts data for processing, and the lack of access to the MARC record by accession number. The pre-order checking, too, would suffer from the limited number of access points presently available on-line between the production of microfiche catalogues.

A further problem also arises, namely the use of the accessions register in recording the absence of an item. That is to say, the register gives a clear indication that an item has been withdrawn, and (via a second list) the reason for this. This it can do because the entry, once made, remains for ever and can be easily annotated. This is not true of computer records. They can indeed be easily annotated, but does one wish to encumber the files and increase the expense of the processing by retaining records — even the briefest of records — for material no longer available? Whether there is a need at all to keep records of this is at least open to question; but this is indicative of the sort of problem which occurs when trying to replace manual systems with automation.

I hope that this example illustrates two points. The first is the way that sensible and efficient use of automated systems demands a willingness to rethink traditional operations. What is needed at the accessions stage is the creation of an accurate bibliographic description of an item and the recording of the purchase details. The first element is precisely the same as descriptive cataloguing, and the separation of the two is therefore artificial; so is the separation of the second part
from the entry of the basic accounts information. The second point, however, is that often the features which are desirable do not yet exist, and one has to make the best of a half-way house. Perhaps we can at Reading cease to create an accessions register as such; but we then face the difficult question of whether or not to enter the purchase details into the MARC record as well as into the accounts system — continuing some of its duplication in computerized form. If we do, we set up a basic system which will apply in the future, in which it is just a question of phasing out the accounts input when possible; but at the expense of staff morale and perhaps staff confidence in the systems design, since they can see unnecessary work being done. If we do not, we set up a system with little unnecessary duplication and with greater savings in time, but with the need some time in the future of changing the system again and increasing the time of the accessioning operation.

It is easy to think of this sort of problem as transitional — once the various programs required are written it will be resolved. I suspect that that is over-optimistic; this particular problem may disappear, but by that time some other possibility will have appeared, which again is not totally capable of achievement. For systems are continuing to develop, and the perfect system — especially the perfect integrated system — not only does not exist but probably never will. In large measure this is because of the limited degree to which most of us can take imaginative leaps into the future. It is only when we have achieved the next step that the future possibilities suggest themselves.

Many people find a fully integrated system hard to envisage. Their thinking still includes a residue of the traditional demarcation of tasks, and what they visualize is not so much integration as interfacing. This may, indeed, be the proper response to the problem; the MARC Users' Group ran a seminar in 1983 entitled 'Integration and Interface' which discussed the two concepts but came to no valuation judgement on them. It would, of course, be possible to set up systems wholly independent of each other, and this has occasionally occurred when two systems which do not meet in sequence in the processing of a book have been automated.
Thus in the mid 1970s Manchester University Library had a short author-title record for its acquisitions system, and a manual cataloguing system in which the catalogue multilith masters were marked up as key-punching documents to produce the short author-title record for the circulation system. No one would regard this as an ideal state of affairs, and indeed the various elements of manual systems were— are— often not as discrete.

Unless there is to be a considerable amount of manual supervision and checking of the operation of systems, it is impossible to keep them totally discrete and yet prevent the sort of chaos in which different systems give different answers to the same questions. This is not just a matter of initial transfer of data from one system to another. The creation of a circulation back-up record from a catalogue record is one of the more common existing examples of connection between two systems. The question of how this is done needs to be examined— recent work by the Bath Centre indicates that simple truncation of fields may not produce the most acceptable record possible in the space available, whereas a more complicated piece of programming may! More important, however, is whether any further contact exists between the two records. What happens when a further copy is added— is a new back-up record generated automatically, or does the process require triggering? What if the original short-record has been modified to render it more intelligible— will it be the modified record which is repeated, or will a new record be created from scratch from the catalogue data? Will amendments to the catalogue record— new locations, changes in the form of heading— automatically amend the back-up record; and can an amendment to the latter be automatically incorporated in the catalogue record? The matter of location changes is particularly important, since it would be extremely confusing to have two possible locations for a single book, especially if there was no clear indication of which was the more recent. Will the deletion of a record from one system automatically delete it from the other? The answers to these questions— particularly negative answers— have considerable implications for the organization of library routines, and for the extent to which a manual
checking system must be set up to ensure the completion of all routines. In many cases such a system will in effect be an extra, something not required in a fully manual system.

Contact may be required between the systems for more than just the maintenance of parallel records. Should one be able to delete the catalogue entry for a book recorded as a loan? Should the entry of a book into a library code in the catalogue record meaning Short-Loan Collection automatically assign the appropriate regime in the circulation system? Can a reader making a catalogue consultation be informed of whether the book is out on loan? If the two systems are as clearly interconnected as this, are they really two systems or one — is there indeed any requirement for a circulation back-up record to have an independent existence? Is it not easier to attach the circulation information to the catalogue record, and generate a short-form of the latter only when actually required for user notices? This raises the question of processing costs — does the whole catalogue file need to be processed for the circulation data every night? — a mammoth task on an individual library basis, and impossible in the context of a co-operative. The length of the basic catalogue entry becomes relevant here, together with the question of whether on-line access is available to the whole record, to a subsect, or only to a virtually independent circulation system record. If the latter is the case, is it worth increasing access points for this record to make it usable as a catalogue, acknowledging the duplication of work done in cataloguing, or would it be more cost-effective to put the main catalogue file on-line?

Potentially more of a problem is the integration of acquisitions and cataloguing systems, which is clearly essential if the laudable aim of having a single record for a book passing through the system from order to withdrawal is to be achieved. Some problems depend on the type of system being operated. Where an order is being generated from data input by the library, which then becomes the basis of the catalogue record (the system operated on a manual basis by inter alia, UMIST and Herriott-Watt University) the problems are few. If the order for the book is made by ISBN, and a MARC record is ordered at the same time, great reliance is being
placed on the accuracy of the ISBN but no real *problem* will be created by the arrival of the wrong book since it will match the record unless a second book exists with the same ISBN. The difficulty increases if bibliographic data is entered in the record at the order stage in order to check that the arriving book is what was *wanted*, rather than just the book with that particular ISBN. If a MARC record is requested also at the order stage, some arrangement has to be made to ensure that it does not overwrite the order data, while nevertheless ensuring that it is the MARC data which normally becomes the basis of the cataloguing record because in the vast majority of cases it will be fuller and more accurate than the order information. (This problem is, of course, not confined to integrated systems; MARC-based cataloguing systems which allow a locally-created record to be overwritten by a MARC record when one becomes available are vulnerable in the same way. At least in such systems, however, the local record can be assumed to be accurate — if incomplete — because it was created with the book in hand. Tests of the equivalence of acronym keys generated by the two records are therefore valid. This is not always true when the local data are derived from order information.)

In considering the use of a single record, it must be remembered that this no longer has to be created perfectly at the first attempt. In a manual system the alteration of a catalogue record in particular is a major undertaking: the main card must be found, all the tracings followed up, the amendment made to each card (or new cards produced if the amendment is a major one), and the cards re-filed. In a computer system producing either fiche output or an on-line catalogue, the recall and alteration of the single record will produce the new data in all subsequent output. It is thus possible to add or subtract access points, or to increase the degree of detailed information in a record, whenever it is appropriate to do so. It no longer becomes necessary to catalogue all books as if they were incunabula, or to inhibit public access to the record by author and title because the classification is proving difficult.

Standing orders for monograph series can present a distinct problem in interfacing both with accounts systems and with
cataloguing. In the former case the problems arise from a multiplicity of items with the same order number, but in the context of an integrated acquisitions and cataloguing system the difficulties are exacerbated by the need frequently to create a totally new record for each volume as it is published. The standing order will have been entered under the series title, but normally the resulting monographs will need to be catalogued individually, under author and title. It is these records which will contain the purchasing details, and it is the individual items for which MARC records will need to be obtained. They thus do not fit easily into any pattern of generating MARC requests at the order stage; some of the order details have to be written across from the standing order to the individual record; and some method needs to be established to check, when the individual monograph arrives, whether another copy has mistakenly been ordered as a monograph because it was not recognized as part of a standing order. None of this activity is easily susceptible of automatic treatment; the interface between the various systems in these cases has to rely heavily on staff input.

One severely practical reason for ensuring the connection of systems, is the need to avoid a multiplicity of equipment. This is not confined to terminals dedicated to a particular system, which require staff to move from terminal to terminal to accomplish different operations; it means in essence the use of more than one computer. This may well be disguised by the existence of the computers elsewhere in an organization; no library would have the space, or the money, to install a bank of computers within the library itself. As discussed in the previous chapter, sharing computers used for non-library purposes may often be forced upon libraries; but if there are more than one, perhaps each requiring a different make of terminal, the problems for library operations become considerable on a practical level, apart from the lost opportunities at the level of system design for effecting economies, particularly of repeated keyboarding.

On the other hand, modern systems of networking can lead to entirely the opposite effect: the use of a number of small computers each coping with one aspect of a system,
and all accessing a single major storage facility. The important decisions to make, in setting up such a system, are how easily data can be transferred from one part of the system to another and how easy it will be for a user at a terminal to access information held in different parts of the system. To take an obvious example, there is little benefit to be obtained from the use of a single terminal to interrogate both cataloguing and acquisitions files if these are still totally separate files and separate enquiries have to be made on each. However, if the enquiry is being run on an index (as opposed to a free-text search), it is possible to search a combined index for two files which are otherwise treated separately.

A system working in this fashion can avoid some of the specific problems mentioned above. Cataloguing and acquisitions data can be kept separate and yet associated when it comes to checking files. A circulation enquiry might still draw its bibliographic data as a subset of the catalogue record, thus avoiding either the problems (and cost) of maintaining two separate records or the costs and processing time associated with attaching circulation data to the catalogue record in a large system of several hundred thousand records, most of which are not on loan.

There are other pressures suggesting the advantages of not integrating too fully. A very closely integrated system may require the re-writing of the whole system in order to upgrade part of it. It is like hi-fi equipment: buy a music centre, with amplifier, record deck, cassette deck and speakers all in one case, and the only way to improve it is to sell it and start again; buy a system in separate pieces and it can be continually upgraded piecemeal. The only difference between a closely integrated system and a music centre is that the former cannot usually be sold second hand! Moreover, some elements cannot be fully integrated – the searching of remote databases always involves a move away from the main computer of a local system. Other aspects may not be worth programming because a suitable system already exists. If a library has automated a number of its procedures but not yet periodicals accessioning, it might be looking to a system such as PERLINE to cope with this
aspect. Naturally this can be run as a totally separate operation; but there are clear advantages if the data on one system can be read by the other. Someone making an enquiry of the library catalogue about the availability of a periodical may need to switch to PERLINE to see if the latest part has yet arrived. Equally, it would be useful if the SDI circulation list of the PERLINE system could read the borrower data from the library's own circulation system, thus saving the double entry of data.

However, PERLINE is itself an integrated system not very hospitable to data transfer other than through its two-way MARC assimilation package. The non-bibliographic data, therefore, cannot be passed across from one system to the other. If the interface between the two systems, a local system and PERLINE, is only workable on an enquiry level by getting out of one system and into the first level log-on procedures of the other, there can only be very limited advantages from running both together. Equally, it may mean that however good the PERLINE accounts system, data on non-periodical expenditure has to be keyed in because it is not directly transferable. I quote PERLINE as an example only; the same problem may arise with any attempt to join together two separate and self-sufficient systems.

Nevertheless, PERLINE provides a good example of the integration of two systems often only tenuously linked in manual systems, accounts and periodicals check-in. In many libraries payment details have been entered on the visible index, so that in checking for non-supply of a journal it can at once be seen whether the subscription has been paid. Proper integration within a computer, however, allows the listing of unpaid subscriptions, and of paid subscriptions with no recorded arrivals. Equally, depending on the library policies regarding allocation of funds and the flexibility of the accounts system involved, listings of subscriptions by funding department or purchasing branch can be obtained with relative simplicity; and all such lists can include up-to-date price information for each title. These features are very valuable in the context of the management of serials subscriptions.

A system whose conceptual basis is of individual routines
interfacing with the data derived from other routines is more easily adaptable to external developments. The range of options for extension of the enquiry can be unlimited, and it would be possible to move out of a local system into a regional or national system, or even into an international information retrieval system such as Lockheed DIALOG. It requires only an alteration of the interfacing software, and not the re-write of the whole system. The interface can, of course, be built into the central computing facility rather than into the terminals. This, because of its greater power, may result in more rapid response to the various enquiries, and perhaps less file-handling. Against this it can occupy a large area of the processor and memory if the system is of any size — for example — a co-operative. As long as there is a standard microcomputer, so that one issue of software can be used to program all the terminals, it may be as cheap to distribute this processing. There is the added advantage that at the expense of some of the standardization local variation — of terminology and approach — can be built in. This is particularly important where the extension to on-line information services is required, since in a co-operative — or even in a multi-terminal single library system — it may make sense for the system to provide access to IPSS or a similar communications network, but for the local terminal to hold details of the dial-up and log in procedures for the individual systems.

The system need not look to the user any different from a fully integrated system — provided the interface works well and quickly. Just as it was suggested in a previous chapter that the intelligence of a microcomputer could be used to shield the user from the different command structures of different on-line databases, so intelligence at the terminal can assist in moving from system to system. As long as the user — reader or library staff — is given the information he requires, it does not matter whether that information comes from the cataloguing, orders or circulation system. In terms of the individual operation of those systems, however, as well as the complexity of the links between them, it may be more sensible for the terminal to access the file appropriate to the key input by the reader, and to note from the various records
(by means of the connections between them) the basic bibliographic information, the number of copies on order and the book numbers of the catalogued copies, and whether or not they are on loan; finally to synthesize all this information and present it in a comprehensible fashion to the user. Any of the systems could be interrogated further for additional data — supplier, bookseller's reports — or additional actions such as making a reservation.

Finally, this sort of approach lends itself to the modular introduction of systems into libraries, and the easy limitation of the degree of information which specific users may obtain. The degree of upheaval involved in introducing an integrated system into a library at a stroke may be unacceptable, not to mention the economic problems it may create. However, it is scarcely reasonable to limit the degree of ultimate integration by the extent to which the library can cope with initial disruption. A system which is designed in modules, but designed to avoid duplication of information, is more likely to cope with the interim stages than a system designed as a whole but only partially implemented. Certain basic features will have to be decided upon at an early stage — features such as whether the system is to be MARC-based or not, and the type of access to files required.

The economic problems must start with the amount of capital involved. If a large number of operations are to be automated, a large number of terminals may be required. To take Reading as an example again, we started with two terminals dedicated to cataloguing; this has increased to four, with occasional use of a fifth; the recent availability of catalogue records on-line has made more cataloguers desirous of access to a terminal, while the Acquisitions Department has also needed to have one. The introduction of the circulation system required six terminals at the main desk and the Short-Loan Collection, together with a VDU and a printer for the production of notices; however, there was pressure from Inter-Library Loans to be able to check the issue status of a book; from the Periodicals Department to begin to create a file of periodicals back-up records and to check the issue status of periodicals; whilst the use of the circulation system to control the passage of books through the bindery
necessitated a terminal in the Binding Preparations Department (a second enquiry terminal is really required). The ability to check the issue status of books led to the installation of a terminal in one of the two subject offices, which is now used for cataloguing in that subject area also. The systems librarian often requires a terminal (which however cannot be permanently connected because of lack of ports). The introduction of the circulation system at the education library and the automation of their cataloguing, involved a further three terminals (phased over two years). Two public access terminals have been added in the main library, as have two further terminals at the main desk. An initial request for twenty-three terminals would probably have met with disbelief in all quarters, and certainly the money might not have been forthcoming.

Moreover, there are the costs — and the time — associated with the preparation for some of these features to be taken into account. It took two summer vacations to bar-code Reading University's bookstock for the SWALCAP circulation system; it would have been silly to delay the introduction of computerized cataloguing until that exercise had been completed. Had the cataloguing not been installed and working, the creation of back-up circulation system entries for pre-existing stock could not have started, nor could the bar-code labels have been produced in shelf-order — at least, not without the installation of the minicomputer and sufficient terminals to have started the cataloguing system anyway. Whereas the cataloguing system could begin with the first new title received, there is little point in automating any operations concerned with periodicals acquisitions and binding until a database at least of current titles has been created.

Nor could the savings to counterbalance the various costs have been made. I have discussed in a later chapter the difficulty of redeploying staff. The introduction of the cataloguing system involved the re-deployment of one duplicator operator and two half-time typists, which took two years to achieve; the reshaping of the professional and semi-professional structure of the cataloguing staff has taken nearly five years, and is still not fully completed. If it had been possible to
introduce an acquisitions system at the same time, we should not only have needed to effect the reshaping of the staff of two departments rapidly, but probably to redeploy our accounts assistant also. The redeployment of such staff, with skills like bookkeeping or typing but without traditional library skills, can be extremely difficult. I have discussed this more fully in connection with the staffing implications of computerization.

Finally, there is the question of how much change either staff or users can take at one time. The introduction of a circulation system affects both groups in a large way — both are finding information in different ways from before — while particularly for library staff there is new information available. The new system may involve changes in regulations which need to be assimilated; or it may enable — or require — the stringent application of regulations previously largely ignored. To expect either group to cope with changes in catalogue format and style of heading, and perhaps a split catalogue, at the same time is perhaps to expect too much. Changes in the acquisitions system will affect users less, unless entries for books on order are to appear in the catalogue; staff involved in pre-order checking, however, will undoubtedly have a new system to cope with. The need to give people time to adapt — not to mention the time taken to train staff in even one of the new applications — almost automatically means that multiple systems have to be phased in over probably two years or more.

Operational implications

Obviously, the drawing together of hitherto separate systems, however it is achieved, must have a profound effect on the organization and operation of the library. One has only to look at the chart of an integrated system drawn up at the Polytechnic of the South Bank to see the way in which information can be fed from one process into another, often round in a perpetual circle, in a way which a manual system could never achieve. Physical limitations on staff activity may also be removed. To take one example, until libraries computerize the full potential of subject librarian systems
cannot be easily realized. Unless staff time is available for large quantities of filing, there is no possibility in a manual system that subject librarians will have access to a full catalogue at the enquiry station — and sometimes even partial catalogues are unavailable. For such of the stock as has been catalogued in a computer system, a union catalogue on microfiche will normally be provided. However, the greater currency of an on-line catalogue will naturally increase the potential, while the access to acquisitions data in an integrated system can enable the subject librarian to be much more helpful about the likelihood in future of finding a specific book.

Much more than this, however, an integrated computer-based housekeeping system can actually ease the administrative problems of running a subject-based library on a minimal staffing level. The number of jobs a subject librarian can do while still manning a subject desk is increased. Book selection from publishers’ information or BNB has always been a standard activity; how much more useful if the catalogue and the order files can be checked at the same time. It is even possible that certain cataloguing work, where interruption is not likely to disturb trains of thought — checking and releasing catalogue records for example — might be done at quieter times. Moreover, the production of both instruction booklets and guides for readers and internal library reports will become simpler if word processing facilities used to produce them can call on the bibliographic database for the description of reference works, or on the circulation records for information. A subject librarian will be able, given suitable selection facilities on the basic database, to produce reading lists in given subject areas, a rather more positive role than merely checking that the library holds the books listed by a lecturer.

For the user, too, there will be profound changes, many of which will be immensely beneficial. First among these must be the ability to sit at a single terminal and discover all the information he needs about all the books he is interested in. Gone is the need to look up a book in the catalogue, go elsewhere to discover whether it is on loan, perhaps go to a third location to find out by whom it has been borrowed,
and to a fourth to make a reservation. All these functions may be accomplished from the one place. In a single operation the user may discover both the books the library has in stock and the books or copies on order. He may be able to move from simply the records of the library's stock into records of holdings elsewhere, or databases containing the information he requires. 'An integrated system that incorporates circulation, inventory, and the catalog system is a powerful tool for indicating materials in the library's collection and their accessibility. If this system also includes community resources and a networking capability, it is the most powerful information access tool in any community'.

However, if this is to be the case, the system needs not only to provide very clear instructions on its use — preferably in the course of that use, as discussed in the chapter on information retrieval — but to enable simple movement from one transaction to another, from bibliographic enquiry to circulation enquiry to enquiry of the registration file and back to a circulation transaction to make a reservation. The options need to be offered to the reader at the appropriate stages; it is not reasonable to expect him to make use of menus, and return to them in between stages of his transaction. Equally the vocabulary in which the instructions and options are expressed must be straightforward and free from jargon. I have raised this point in connection with on-line catalogues, but naturally the greater variety of information which is offered to a user by an integrated system requires even more careful guiding. A reader must, for example, be clear in his mind whether the book he has found on the screen is actually in stock or on order.

It is likely that the pressure for on-line public access catalogues (OPACs) will come most of all from non-cataloguing systems. Many libraries mount circulation back-up files on-line (and satisfy a good number of enquiries from that very limited data set), but pressure grows from readers who do not have a correct bibliographic citation and have to go to the main catalogue before returning to the circulation system to find out useful information on the loan position of the book, or even its up-to-date location where the catalogue record is on microfiche and is perhaps four weeks out of date.
Readers do not always appreciate the difficulties of combining systems, but there is no reason why they should; if all the material is in machine-readable form, why should it not all be accessible together? Thus the pressure becomes a push not only for an on-line catalogue but also for an integrated set of files.

Equally, safeguards have to be considered in regard to public access to integrated systems. Naturally readers cannot be allowed to amend the circulation files, nor to amend or annotate the catalogue. There can equally be problems in a self-service reservation system. From the library’s side there can be a worry that reservations are being made casually, without consideration of the extent to which the book is really desired or of the extent to which the likely timescale of the return of a book meets the needs of the reserver. Readers using systems where reservations have to be marked against specific copies may not understand how to choose the best copy for reservation (library staff do not always get this right) or may reserve all possible copies, leaving a trail of subsequently unwanted reservations and falsifying statistics on the demand for certain titles. Reservations may be acceptable only if the machine-readable reader’s card is produced and read, to avoid the making of reservations in other peoples’ names. From the reader’s side, it is necessary for there to be staff back-up to help with problems such as which copy will be back first, or problems when a book is not on the shelf but not on loan. There may be worries about whether the reservation has really been noted by the system, or has been lost in some insatiable computer maw. Nevertheless, the ability to reserve without filling out cards with all the details which are already stored on the computer might encourage users to make more reservations, and to give a truer picture of the deficiencies of the library’s stock.

Safeguards may also have to be built in to prevent access to the list of books borrowed by other readers. It is naturally desirable for a reader to be able to check what he personally has on loan, and some libraries are prepared to name the borrower of a specific book — although this is a little more controversial. Few, if any, would be prepared to allow one reader access to a complete listing of what another reader had
on loan; it may well be that the forthcoming Data Protection Act makes specific requirements about the amount and nature of the privacy which must be maintained. It may, however, equally insist that a reader be able to see his own registration file entry, including any comments about his reliability as a borrower which may be included. The Act will of course not insist that the reader has access to such information on-line; however, the provision of hard copy could occupy a considerable amount of staff time if readers were to prove awkward in demanding their rights.

An area in which communication between readers and staff might be improved is in recommendation of additional copies, of new books, and of location changes. At present all such recommendations normally have to be made via cards; it ought to be possible to use the electronic mail facilities of many computer systems. The ability to make the comments or requests actually at the point of search would improve the response — even better than recommendation cards on top of a card catalogue — while the ability effectively to write on a blank page rather than a pre-printed form would give the user greater flexibility in terms of the message. The facility would be both a recommendations and a more general suggestions system; like all such systems it would be open to abuse, but it could be arranged so that other users had no access to the existing file. The occasional vulgarity would thus cause little inconvenience, and by affording no publicity the incentive for the sort of comments typical of suggestions books would be vastly diminished. In the case of recommendations for additional copies or for re-classification or re-location, it might be possible for the system to transfer data from the catalogue, so that the user was spared the necessity of writing out bibliographic details.

Theoretically there is nothing to prevent the same from being true of new requests for which a record can be found on any database to which the library is on-line. In practice a library would have to think very carefully how far it was prepared to stand the costs of allowing readers to access remote databases — costs both direct and indirect, in the additional requests for purchases or for inter-library loans — and how far it was prepared to stand the resulting confusion
in readers' minds as to whether or not the book really was available locally. However, the ability of a member of the reference staff to search easily both the local catalogue, union catalogues, and on-line indexes to and abstracts of periodical contents, must have the potential to be a far superior reference service to most traditional ones.

Nevertheless, it is perhaps possible to overdo the 'workstation' concept. While it may be useful to have access to a wide range of files, internal and external, from any point at which a member of staff may find himself working, there are certain jobs which will normally be done from specific places. Subject cataloguing may normally be done, even by subject librarians, at a desk in the catalogue room — both to avoid the unnecessary movement of books around the library (with security problems and the chance of mislaying some) and to provide the opportunity for discussion and suggestion which is often vital. It is unlikely that the circulation desk would relish subject librarians altering dates for return of books, especially if this involved a breach of regulations about the possible number of loans or renewals. Equally, queues waiting to return or borrow books would look askance at the use of that particular terminal for a complicated cataloguing enquiry. Staff might or might not accept the discipline of doing all their work from a single place, which seems to be the ultimate aim of integration, but I cannot believe it is good for a library to have the senior staff deskbound rather than moving round it, and involved with their fellow staff. In a modern library flexibility has to be the theme — flexibility in design of the building, in layout of services within it, and in the use of equipment. This flexibility implies that any computerized service can be run on any terminal, so that re-wiring if and when the library is re-organized is kept as cheap as possible. Several separate systems just cannot work. Nevertheless, because one can do something at a terminal does not mean that, operationally, it is sensible to do it at that particular place.

From the point of view of readers and indeed of most of the library staff this form of interfacing produces a system which is integrated in all respects except the actual internal workings of the computer. How far this is the case will depend
on the size of the computer (governing the speed of response when checking a number of different systems) and the degree of 'front-end' programming making the internal workings totally invisible to the user of a terminal. These two elements will be governed to a large extent by questions of cost, but there are cost advantages in this sort of system in some computer applications — particularly those in large libraries with consequently large databases.

Nevertheless, there are some areas in which the fully integrated system, using a single record as its basis, can be advantageous. Even in a big library, such a system can be written to work efficiently on a large processor. There are some obvious system economics in minimizing the need to access multiple files for virtually every enquiry. Most attractive of all, however, is the greater degree of feedback possible when all the data is collected in a single place. It was this potential which led the University of Sussex into their present fully-integrated system — which, incidentally, they have been able to develop part by part. The ability to analyse use against purchasing data — who buys the books which never go out? — or cost of titles by the subject area in which they are classified (rather than just by purchasing department) can be of great help in collection management; this sort of cross-routine analysis is easier the closer integrated the system. However, there is no simple boundary on one side of which a system is integrated, on the other side it is a series of routines with interfaces. Instead, there is a continuum between total integration and total separation. The decision facing libraries starting a new system is how far along that line they wish to find themselves; the answer will be closely interrelated with the organizational and administrative approach chosen.

References
3. Hawes, D F W and Botten, D A Library automation at the Poly-
Computerization affects staff in a number of different ways. Some — especially staff newly out of library school who know something of the potential of computers — are likely to be enthusiastic. Others, perhaps the majority, will have a number of worries. Many will know that automation has brought redundancies in other industries, and will worry about their own job security; this may be most marked among clerical staff. In academic libraries where senior staff have contractual job security this aspect is likely to cause little problem among them. They, however, will be concerned about possible loss of job interest and responsibility, the general fear (which will affect other staff also) that the use of a computer will turn them into automatons. Even outside the use of computers for housekeeping purposes, in areas such as information retrieval, there may be initial resentment among staff who feel that their own professional skills are being undermined. A few staff may be perceptive enough to worry about whether they are likely to acquire extra work.

Among all these reactions, the most damaging element for staff morale is rumour and speculation. The nervous anticipation of the unknown, fed by the horror stories of those who have known automation elsewhere or (more dangerously) know of its effects at second or third hand, can set up a strongly antagonistic attitude before the facts are known or
any decision made. It is important for management to recognize that computerization will affect the sort of work staff are doing, and that it is important for them to retain the trust of the staff. This can only be done by facing up to the realities of the situation, and by dealing with it in detail; bland generalizations such as ‘It won’t make any real difference to most jobs’ will fall flat. Such a phrase, indeed, cannot be expected to inspire confidence in management, for if computerization will really make no difference why is it being introduced?

Library managers, like those in other occupations, must recognize the very real fears that computers inspire in some established staff; fears not just of redundancy but of loss of power. In libraries there is a very common anxiety that power will shift from ‘true’ library staff to designers and programmers; that the experienced staff will suddenly become unacceptably ignorant in this new sphere. In many cases, events seem to witness to the truth of these apprehensions, as younger systems staff gain influence in the library and shut out their colleagues with a wall of incomprehensible jargon and supercilious looks at the naivety of their questions.

It is well to be clear what the implications of computerization are likely to be on the staff. These will vary somewhat from area to area of library work. Word processing ought to take away some of the tedious repetition of office work, just as a computerized accounts system ought to end multiple entries of invoices and a lot of the counting and calculation which exists in a manual system. Both may involve the learning of new skills, which may interest or even excite the user; however, particularly in the case of word processors, one has to face the possibility that what was a skilled, if boring and repetitive job becomes looked upon as to some extent machine minding. This is particularly so where, for example, continuous stationery is not in use; the production of a large number of personalized standard letters may become a case of feeding in a sheet of paper and pressing a button. Indeed, there are many instances where the job becomes more boring with the introduction of word processing, although this is more often the case in a large office;
libraries, fortunately, staff are likely still to perform other secretarial tasks in addition to using the word processor.

A circulation system is another area of operation in which the staff should be freed from some of the least rewarding of tasks, particularly those of filing and searching manual files. It is also, of course, an area in which savings in staff may be expected, unless the staff has already been cut to an absolute minimum; staff may therefore have legitimate fears about redundancy, particularly since the savings will be at the clerical level where job security is less. Redeployment may be little more attractive, except financially; where it consists of finding other jobs to do, these may prove every bit as boring as the filing which has been taken away, even if they are more use to the library’s operation. Such a task as putting the shelves in good order will seldom excite enthusiasm among library assistants. While some, especially those looking towards professional training and a career in libraries, may look forward to learning to use computers, there can be frustration at the low level of knowledge expected or imparted.

Moreover, the existence of a machine can dramatically alter the relationship between staff and reader which is often one of the rewarding elements of the job. As has been indicated in previous chapters, computerized systems can be less flexible than manual systems, forcing staff sometimes to appear unhelpful and unaccommodating. The fact that they may pick up infringements such as overborrowing which previously went unnoticed may make the staff seem stricter in the eyes of the readers.

Whereas in all these areas the effect of the computer is to free staff from routine operations, in the cases of cataloguing, serials management and to some extent acquisitions its effect may be exactly the opposite. This will depend in large measure on the methods adopted. If all the cataloguing is to be home-produced, the job of a cataloguer will be little changed; only those engaged in the multiple production of cards will feel any threat to their position — typists, duplicator and multilith operators. Cataloguers may rejoice at the loss of filing if a microfiche catalogue is produced (for some reason catalogue filing tends to be the task of the most
senior rather than, as with most filing, of the very junior). The loss here may be the library’s rather than the staff’s; nothing makes a cataloguer more conscious of the difficulties of using a catalogue than being pounced on while filing by a reader seeking help.

However, if records are being obtained from outside sources and used with as little modification as possible, the traditional cataloguer may well feel his or her position threatened. No longer will they be the priest of an arcane but vital religion without which the library cannot function; any member of the junior staff is qualified to request a record and process a book through all its stages. The cataloguers are left with only those books for which records cannot be obtained — arguably the most challenging, and those on which their professional skills should rightly be brought to bear, but also the most difficult and least rewarding. Moreover, some of these books may be quite old, received as gifts, and not felt to be essential to the library’s task. Even if local classification is continued, thus maintaining a professional input into the record for each book (as well as the integrity of the library’s classification scheme), morale may be hit hard by the approach required to the rest of the record. A traditional cataloguer expects to choose headings (using the authority of bis catalogue, not, for example, the British Library), to select the main heading where there is any sort of choice, and to ensure the accuracy of the entry as a whole to the last full stop. I have even seen a catalogue card reflecting the slightly odd punctuation of the title page in which an unexpected semi-colon was followed by ‘(sic)’. Now as long as the choice of main heading on the record received is valid he will be expected to accept it. Moreover, he may well be told to disregard the title after the first few words (which will ensure its correct filing); not only mispunctuation but misspelling may be allowed in order to speed the throughput and minimize the number of corrections to be made. It is not to be wondered at that the reaction of someone who has catalogued by traditional methods to traditional standards for thirty years or more is to feel disillusioned as he finds all his values undermined.

The sense of downgrading may be increased if, in addition
to all the problems mentioned, a cataloguer is now expected to do his own keyboarding. In chapter five I mentioned economic reasons for keeping the two tasks separate, but equally an on-line catalogue system presupposes that some at least of the work will be done at a VDU by the cataloguer. Again, the sheer inability to cope with editing commands or keyboarding generally may give rise to an unnecessary feeling of inadequacy.

In periodicals work, the avowed intention of computerization is frequently to reduce the vast majority of the periodicals operation to a clerical level routine. One of the claims of a system such as PERLINE is that it can avoid many of those situations where the librarian has to exercise judgement — it automatically makes claims for missing parts, tells the librarian what part to expect next, takes the wondering out of waiting for irregular publications, and routes the item to the correct place. This is how it is operated also: its introduction at the Library of the United Kingdom Atomic Energy Authority at Risley, Cheshire was deliberately intended to enable the large number of titles to be handled at a clerical level, and it seems to have worked.²

Acquisitions departments may seem less affected, but the view may be different from within. For example, if the first step in dealing with an order is to search a database to find a record for it, this will remove, in many cases, the acquisitions librarian’s traditional expertise of being able to choose the appropriate bibliography in which to look up the bibliographic details. Like the cataloguer, he or she may resent having to rely on an outsider’s work; like the subject librarian, he or she may feel that a knowledge of subject bibliographies is being undermined. However, even more difficult to accept may be the housekeeping implications of computerized routines, particularly the loss of that indelible record, the accessions register. No matter how much time is saved by using the product of other automated areas to fulfil the functions of this volume, there is likely to be resistance; again, it arises as much as anything else from a feeling that the work done over a number of years is being undervalued, usually by younger staff.

Over and above (or below) all these attitudes there is often
a simple fear of the machinery, an unwillingness to tamper with something you do not understand. Frequently this arises from an ignorance of how computers work, leading to a feeling that any wrong move could bring the whole system down. Many people worry about the lack of a printed record, and fear that they may unwittingly wipe out a whole set of data. Others are unable to trust the machine, and wish to check and double-check its operation at all stages. All these attitudes lead to a reduced efficiency in operating the system, and to staff who are at best uneasy and at worst distinctly unhappy.

What methods can be adopted to prevent, or at least minimize, these anxieties? First and foremost, it is important to involve at least some of the staff from the very earliest stage. This is sense from all points of view, since no librarian really wants to make a decision on whether or not to computerize without someone to discuss it with, and no librarian except in the smallest of libraries can be so confident of knowing in sufficient detail how his library runs that he does not need advice and comment from the heads of various sections. From their point of view this may at least lessen the feeling that everything is being introduced over their heads. The more staff who can be drawn into the discussion at this early stage the better, both for the sake of staff morale (avoiding the establishment of a clique) and for the ideas that some of the younger (and therefore probably more junior) staff may contribute. The Automation Group established in the Polytechnic of the South Bank indicates a possible composition of such a group.3 Even at this early stage there is much to be said for visits to libraries where automation plays a major role, to get staff accustomed to the idea; however, it may be wise in the early days to choose places where the attitude to automation is constructive and positive and where its introduction has been a success.

At this early stage it is important to offer some general instruction in, and explanation of, the way computers in general, and computerized library systems in particular, work. Some of the points raised above can then be answered. Questions of data security need to be explored, and staff need to be convinced that their requirements will be met.
Staff, especially older staff, have to be helped to understand that computers are not magic, and that just as they perform their operations predictably so the problems and failures have predictable effects, which a system can be established to cope with. For this sort of education, very basic courses or talks are required. The expertise for these may be available in the library, but if not it is worth seeking it locally in the profession. The newly-formed Information Technology Group of the Library Association is involved in compiling a register of expertise among its members, who are scattered throughout the country; the group might thus be able to suggest people who could assist.

Apart from obtaining as much information as possible, and assessing the general merits or otherwise of computerization, there is little that can be given in the way of advice. The problems at this stage are those of any management innovation to which there is a certain degree of inbuilt resistance; they come down in the end to personality more than anything else. To quote Dennis Hawes:

The hardest part of management will always be the selection and quality of leadership and the motivation of the work force. If this can be achieved the deployment of resources and management of the environment is likely to take place to the satisfaction of the individual and the efficiency of the organization.4

Once the librarian has decided which side of the debate he is taking, he must be able, if not to convince, at least to lead his staff in the direction he wants to go. That means persuading them that his reasons are rational and not purely emotional, and that he is firmly convinced of the correctness of the decision; it means creating an atmosphere of trust in his motives even when doubting his conclusions. This atmosphere will not exist unless the librarian is completely open about what is happening and why, which returns to the point about facing realities made at the beginning of the chapter. If one is being honest, it is unlikely that in a library of any size the librarian will carry along all of the staff. At this stage he must identify those staff whose cooperation is crucial to the scheme, and concentrate his efforts on winning them to his side. If this sounds cynical or Macchiavellian, it is
perhaps because it has been presented as a sequential process; in practice the ideas on whether and how to computerize should arise out of general discussion as a sort of concensus. In the end, however, the librarian will need to decide which staff are crucial to the operation, and if general agreement is not forthcoming will need to be constrained by what this group are prepared to accept.

There is no substitute for seeing things in action, and visits to computerized libraries are extremely important. It is vital to get as wide a view of the operations as possible, which means taking a number of staff, preferably of differing levels, and letting them talk to their opposite numbers. It is essential to talk to staff actually using the system, preferably out of earshot of chiefs, deputies, or others with a vested interest in justifying it. No system is perfect, and one may have had very valid reasons for choosing one set of imperfections as opposed to another; nevertheless, I know from personal experience how sensitive one can get to outsiders (and even one's own staff) when they point out defects and problems. There is a tendency to attempt to disguise them, or at least react huffily, instead of saying honestly that on balance this was the best system for you, or the best system available at the time. Moreover, as the discussion of types of system will have indicated, many problems are difficult to foresee and only appear in operation; these are perhaps the most important for an intending user to know about, and some of them may be unknown to, or certainly disregarded by, the systems librarian because they do not really affect his daily work. All this suggests discussion with library assistants as well as senior staff, but it is likely that library assistants will talk more freely to other library assistants sitting beside them than to a visiting chief or deputy.

However, library assistants and others will acquire more useful information if they know the sort of things to ask about. This explains my emphasis on involving staff at all levels even in the earliest stages of decision-making. A good briefing session before a visit, together with a chance to read any descriptions of the system to be looked at (in Vine or Program, for example) will pay dividends in terms of the amount of feedback. Incidentally, the whole visit will then be
much more value to the staff than otherwise, and will be a useful part of a general training programme as well as part of the computerization exercise. Equally important is the subsequent discussion, which can start on the journey back by train, car or minibus — the latter ensures that all staff will be together and that probably none of them will be supposed to be concentrating on driving. This is a good time for voicing immediate impressions and noting contradictions between what people have been told; a slightly more formal discussion should take place subsequently, perhaps taking the form of a composite presentation of what was seen, to staff who were unable to go, followed by questions from them and comments and answers from the party who visited. (This, too, is a valuable part of a training programme.) Naturally, a number of questions will revolve around people’s jobs in the system inspected, but probably in the initial stages it is better to consider the relationship of the system to the library’s operations than its staffing consequences. It is important to isolate the one or two systems which will do the required job properly, so that further investigation can be concentrated. Of course, no system may suit and the decision be taken to start designing one’s own, or to eschew automation altogether.

Small study groups to cover specific areas of the system are a good idea if there is any likelihood at all of computerization becoming a reality. These can again involve staff at many levels, and will get discussion going generally in the library. They can also concentrate on practicalities of operation in these specific areas, something which can otherwise be overlooked. This becomes especially important if it is decided to modify a purchased system, or to design a system locally, rather than to accept a package as it stands with all its imperfections. These groups will also be crucial in establishing the necessary library routines to ensure a proper flow between computerized and non-computerized work.

All this may sound idealistic; it is, but it is also highly desirable and not necessarily totally unattainable. The degree to which all staff can be formally involved will vary according to the size of the library service amongst other factors. Informal involvement will be easier to achieve, at least if staff
of all grades are part of the formal structure, and can therefore disseminate information. To a large extent the suggestions made above have used experience from a number of places to fill out the gaps acknowledged by Norman Turner in what was nevertheless a very well-conducted exercise at Falkirk. At least one of the equally excellent talks he has given on the subject has been published, but it is worth outlining the system here.

The immediate incentive to computerize arose from the creation of Falkirk District Council out of two burgh systems and part of two county systems, and the need to integrate and unify the operations if possible. The initial working party set up to consider the possibilities consisted of a representative of each service point; this made communication to other staff relatively straightforward (within any limits imposed by personalities). This sort of system will, of course, only work with library services of the right size — otherwise it could result in a working party which is too small (fairly easily rectified) or one which is much too large to work, which is a bigger problem. Another important feature of the Falkirk operation was the refusal of Mr Turner, as chairman of the working group, to allow the use of jargon in its discussions; thus one frequent barrier between those who are involved with computers and others was removed right from the start.

Once the decision to automate had been taken, and the system chosen, the programme of informing and involving all other staff was intensified. Visits to other libraries and external courses were supplemented with internally-run seminars using outside speakers. Interestingly, the only courses not found very useful were those given by computer specialists, and this related largely to the point made much earlier that such people start with a large number of incorrect assumptions about how a library works. A weekly newsletter ran for 35 weeks. Professional staff were able to do a week’s exchange with an opposite number in a library which was already automated, to get some feeling of how it worked; unfortunately the differences of administration were so great that it was reluctantly decided that library assistants would not benefit from similar exchanges.

Falkirk were lucky in that they were able to use two
library school students on fieldwork placements to do some investigation into staff attitudes. Although the sample was small, it gave some idea of how far the attempts at involvement had worked. Its main surprise was the small degree to which library assistants had become involved, although this was remedied later in the training programme. I have made some suggestions as to how this might be achieved at an earlier stage. Another aspect which stands out very clearly is the amount of time that the 'public relations' side of the exercise took. The need for this should never be underestimated. Norman Turner comments: 'The management of technical innovation at the end of the day is the management and motivation of human beings. It is about avoiding trauma for staff and users'.

One vital element was clearly the priority given to communication. While comments on the newsletter included suggestions of its redundancy ('Explained things already known') and the implication that it could at times have been better-written ('Found it difficult to grasp the written explanations'), it clearly had a major role in combatting the ill effects of the grapevine. Informed comment is normally better than uninformed speculation. However, although communication is essential it is equally often next to impossible. The point is made forcefully by Peter Gratton:

From the outset it had been the intention to keep staff fully informed as ideas and activities progressed. I have however to acknowledge a degree of failure, not because of unwillingness or any desire to suppress panic, but because of a variant of SOD’s Law: 'At the time of greatest need for communication there is the greatest shortage of time to communicate'. When things are happening everyone appears, not surprisingly, to be wholly involved in making them happen.

Other factors may also cause failure in this area. At the time I write this very chapter I am involved in introducing the accounts system in Reading University Library. I am very conscious of the fact that the accounts assistant has not seen the chosen microcomputer, nor met the two members of the local firm who are designing the system — has never, in fact, had any direct discussion on the design. This results largely from the need to make a rapid decision as to machine and
system while the accounts assistant was on leave — a need based partly on the availability of an extra discount and partly on the imminent early retirement of the accounts assistant herself. The other factor was her four-day week (Mondays to Thursdays) coupled with the fact that the systems designer seemed to be free only on Fridays. I have myself kept her informed as far as I can of thinking and developments, but I acknowledge that this is far from a recommended approach.

In the early days of exploration and discussion, the emphasis is on the way the computer system will work, and what it will do. Once a system has been chosen, or when the options have been narrowed to two or perhaps three, the emphasis must change to how the library operations will be altered to include the computer system. This has been well documented by Dennis Hawes in the description of the introduction of computerization at the Polytechnic of the South Bank. Although questions of possible redundancies and redeployments will have been raised at initial stages, and general policies on these will have to be explained, nothing can be done in detail until the specifics of the system are known. Among the variables involved in 'selling' a system to staff is the attitude of any unions involved. These days most unions have experience of the effects of computerization, and are not unthinkingly antagonistic. Quite rightly, however, they wish to protect the jobs and the working conditions of their members, and although when the staff are strongly unionized the involvement of officials from outside the library and the interaction with national policies may all cause difficulties, in the main the questions to be discussed are those which a good employer should be discussing even with a non-unionized workforce. Where good relationships with the unions already exist, their involvement from an early stage is more likely to result in positive attitudes. Where there are already differences between unions and management, computerization may well be seized upon as, inter alia, a form of blackmail — particularly when there are strong pressures on management making the introduction of computers imperative.

The question of redundancies and redeployment will
probably be the immediate priority. It will be important to isolate the posts affected, and to explain to the individuals themselves, what arrangements are to be made. In academic, and usually in public, libraries people are unlikely to be declared redundant, although it has happened at times. Usually the system of 'natural wastage' operates, and it is important to explain exactly what this means and to reassure staff that pressure will not be applied on them to leave. Once various areas of the service have been earmarked as likely to require fewer staff, it is helpful and sensible to replace posts in those areas which happen to fall vacant before the new system is implemented with staff employed for a fixed term — even if that period takes them beyond the actual implementation. The librarian can then give his authority a timetable of at least some of the savings to be made. This is of course one of the areas in which unions will have strong opinions, particularly at times of high unemployment, and if it does raise conflict there is little that can be done except to face it out, or give in and achieve no savings at all. The librarian himself may be very torn because he could happily use the spare staff to enhance other areas of the service. It is important that he involve the personnel staff of his parent body, for four reasons: they have (or ought to have) the proper training for, experience in, and contacts for negotiating with the unions; it avoids any suspicion that the librarian's divided loyalties have led him to cave in to union pressure; they will be aware of likely job opportunities in other areas of the organization; and it will assist in depersonalizing the problem and in preventing the souring of relations between the librarian and his staff.

Redeployment is an extremely difficult and wide-ranging subject. Different sorts of staff present different problems. Genuinely clerical staff — catalogue typists, for example — may be difficult to redeploy within the library because of a lack of similar work (although at Reading it was possible to redeploy one as a telex operator). They may have skills which can be used elsewhere in the organization, but this too may cause problems. First, they may themselves be unwilling to start afresh with a new set of colleagues; second, they may have been graded higher than copy typists because of the
complex layout of their work, but not possess skills (such as shorthand) expected of that grade in other departments. Library assistants without any career aspirations may settle for another clerical job elsewhere, but are more likely to enjoy the non-clerical aspects of their work, particularly contact with readers. A move to another department, even (in a local authority) one which involves meeting the public like housing, will not allow them to establish the same sort of relationship. Library assistants embarking on a career in the profession will naturally resist any attempt at redeployment outside the library. Against this, job mobility among library assistants tends still to be fairly high, and they are usually interchangeable within the library. It should, of course, be borne in mind that it is usually the more flexible, enterprising and valuable assistants who will be going to library school or moving elsewhere, and that those who remain will be less easily retrained to work in other areas of the service.

These considerations apply equally to the redeployment of senior staff, which is virtually certain to be confined to redeployment within the library. These days there are insufficient job opportunities for natural wastage to be a viable option except where the average age is high and retirements may be expected. Equally, certainly in academic libraries, the senior staff are the most likely to have contracts guaranteeing tenure, and in any organization they represent the group which will cost most in redundancy payments. Finally, they represent (one hopes) a cumulation of expertise which should not be lightly discarded by any librarian.

The biggest problem is that where computerization has impinged upon areas of professional work — for example in cataloguing — its effect may well have been to reduce only slightly the number of staff required in the operation, but to cut drastically the degree of professional input, of decision-making and of autonomy. The correct response is to employ staff at a lower level — semi-professional or first-professional grades — and use the experienced staff released to perform fully professional duties elsewhere. In the present climate this solution founders on the lack of money to finance the extra posts required — what chief librarian today would have the temerity to go along to his library committee and request
£150,000 for a computer system and three or four extra staff? At all times the solution may collapse because of the nature of the staff involved. If the library being computerized is functionally organized, the ‘backroom’ staff may well contain the sort of people who cannot, or will not, be forced into close contact with users; yet this is normally the professional area that needs to be expanded.

Whatever the reason, computerization of professional functions frequently results in the reduction of the interest-element in the job. This is the hardest personnel problem to cope with, for nothing is more demoralizing to an assistant librarian than to know that, as soon as he retires, resigns or can be moved, the work he is doing is earmarked for a senior library assistant. Just occasionally, this may not cause problems, when the staff member in question is happy to settle down to a routine job only moderately demanding. More frequently it results in silly errors because full attention seems too much of a bother for something so mundane and mechanical. The only answer I know is to face this as early as possible; to discuss the problem with the staff involved; and to look for any aspects which can be seen as more challenging. Cataloguers may accept that knowledge of MARC structure replaces some of the knowledge of cataloguing rules. The answer may be to divide most of the professional posts in the library, so that senior staff spend half their time on this fairly routine work and half on the more satisfying tasks of another department. It may be necessary to delay part of the expected savings of the new system to preserve an element of the job, such as classification, or to accept that some elements are going to be checked which do not need it simply to maintain staff sanity. It seems to be the case that when this sort of approach is taken, the result is only to slow down the intended changes rather than to block them; good staff will see the value of the savings, and will themselves work out a way of coping if pointed in the right direction and given time to adjust. Management is, after all, a matter of leadership, not the prescription of every action to be taken by staff.

One aspect of a system in which all staff will be interested is the records it will make of their activities. To many people, computers represent Big Brother — a form of spying on the
amount of work they are doing. To be fair, some managers have seen this as an advantage of computers also, and have attempted to use the data thus gathered to establish ‘norms’ of work which then have to be matched by staff. This has particularly been the case in typing pools where typewriters have been replaced by terminals to a central word processor. Apart from staff demoralization and dissatisfaction, the only result has been to heighten the ingenuity of staff in beating the system.10 It would be a brave manager who tried to establish norms of work in a library, when some tasks depend on the unpredictable arrival of readers and some on the unpredictable difficulty of books. Looking for personal throughput in a cataloguing room may lead to cataloguers choosing only the simplest of books; if a target is set, it is better set (or at least monitored) collectively, and it should be realistic.

Most systems will enable the manager to find out, in some fashion, what an individual has been doing. The librarian has the choice of denying that such a facility exists or admitting its existence and explaining under what circumstances (if any) he would make use of it. The first course may seem safer, but at some stage some member of staff is going to realize the truth — especially if the same sort of data is used to detect public use of certain terminals or the times of peak activity. Certain statistics such as the number of books catalogued or the number of loans are traditionally recorded to indicate the level of activity in the library, and if these statistics can be gathered simply from the system rather than laboriously by counting, then staff are likely to be favourably disposed. To some people the keeping of statistics is important. Readers of C S Lewis’s ‘Narnia’ books will remember Eustace, who ‘always had this notebook with him and kept a record of his marks in it . . . and would even go to people and say “I got so much. What did you get?”’.11 In itself, therefore, the statistical data from the system may not be a bad thing: staff do require assurances as to their uses, and perhaps a guarantee that they will not be used as evidence for disciplinary action without prior warning.

So far I have been concerned with introducing the computer to staff who are suspicious of its effects. Some staff
will have had experience of automation elsewhere, and be ready to accept it — they will have a busy role in preparing their colleagues. Some, however, will be without experience yet be very favourably disposed, or will have experience only of very sophisticated systems. There is a danger that their expectations will be too high, and that they may raise those of other staff to excess also. No system is likely to eliminate all routine work; nor is it likely that the full potentials will be realized in the first instances. It will be disheartening if staff have been led to believe that all filing will be eliminated, only to find that they are still for a while filing catalogue cards. It is all very well offering the attraction of author-title look-up in a short title catalogue as a simplification of the reservations process; this may in many cases have to be tempered with the reminder that short title records will not exist for the entire bookstock.

It is in this area that visits to other libraries can cause problems. First impressions of a system can create a very favourable picture; it may require quite detailed investigation to discover all the drawbacks. It may even be true that the circulation system seen on a visit is better than the one chosen; the choice may have involved questions of compatible cataloguing or acquisitions systems, or of future development — not to mention questions of cost. The 'leapfrogging' of systems means that one which has worked successfully for a number of years appears out of date against one recently installed elsewhere. If possible, demoralization of staff should be avoided not only by explaining the reasons for the choice, or the state of the art at the time of choice, but also by making use of what has been seen in improvement and development of the local system.

Sometimes it is the looking ahead to future improvements itself which can be demoralizing. The introduction of a microfiche catalogue can be moderately traumatic. (It probably ought not to be, but the combination of seeing machine filing for the first time and reader-resistance to the equipment do not augur well.) It does not help the cataloguing staff, if they are reading through the first issue of the catalogue to isolate as many errors as possible, to hear the librarian announcing that the fiche catalogue is only an
interim stage on the route to a proper on-line catalogue. It equally does not help when readers come in and ask questions, and when told that the answer can be got shortly or can be found in the microfiche catalogue say 'Oh, can't you look it up on your VDU?' The whole question of publicity and the conditioning (usually called 'education') of readers is treated later, but it is important to note that their expectations can be raised too high also.

In some areas of computerization the decision on a system will be followed by the introduction of equipment to operate it; in the case of circulation systems, however, there will probably be an intensive period of preparation. This has been discussed in the relevant chapter in terms of allowing for the costs, but the staffing aspects need to be considered also. If labels are to be produced locally, someone has got to undertake the boring task of printing them. Others will subsequently be involved in sticking them into the books. While both operations require a certain level of attention and alertness to prevent mistakes which could cause major confusion, they are boring and repetitive jobs which discourage this sort of concentration. Basically, staff can be employed on these jobs only for short periods, although temporary staff, who are able to see an end to their boredom, are able to stand it for longer at a time.

Clearly it helps if the job can be done in conjunction with something else. In Reading University the making of labels was done while on duty at the exit control desk (itself not a mindbending post), and was usually done in half-hour bursts interchanging with some equally routine checking of microfiche entries. No one volunteered to spend extra time on the exit control, but equally no one actually went mad. During the summer vacation students were employed who alternated between making the labels and sticking them in. It was discovered that the latter job could be tolerable for quite long periods when there was an end in sight. Permanent staff at senior or experienced junior level were used to supervise and check, and to follow up queries; this presented sufficient challenge for them to feel properly utilized.

It is important that staff, especially permanent staff, employed on this sort of work realize the purpose behind it.
To make labels for an issue system you have seen working and which will ease your job is one thing; to make labels 'because someone has told you to' is another. When staff are employed temporarily it should be made clear to them before they come what sort of thing they will be doing. Some libraries have used staff funded by the Manpower Services Commission, although in certain cases this has caused problems with the unions, who tend to look on this as exploitation and a way of avoiding the employment of the right number of staff at the right salary. Although in the early days of such schemes it was possible to take on staff for fairly routine work, the MSC have become more rigid now about the training which is given. It is certainly likely to cause unrest in a library if MSC staff are involved in all aspects of library assistants' work — the cries of 'cheap labour' will seem justified, and a permanent library assistant will scarcely relish spending an hour printing labels in order that a temporary assistant can learn how to work at the main desk. Resentment is also caused if permanent staff feel that, because of their closer involvement with it, temporary staff are learning more about the new system than they are themselves. Again, communication is of prime importance.

This continues to be true when the equipment actually arrives. Usually there will be a delay between its delivery and its installation, during which time it will probably be visible to staff, or they will be at least aware of its existence. Unless one is exceptionally lucky, there will be a further delay between installation and acceptance in full working order — one board on the computer will prove faulty, the communications line will fail (if, indeed it has been installed — Hatfield Polytechnic waited some months for theirs), or the power supply will have been wrongly installed. During this time it is vital to keep staff informed of what is happening, what has gone wrong, and when it is likely to be corrected. This cannot overcome the disappointment (relief, in some cases) or prevent the growth of niggling doubts that the system will prove reliable in operation; it does, however, prevent people from writing it off completely and trying to live as if it will never happen. The difficulty here is that the systems librarian, or whoever is responsible, is at the mercy
of the engineers, who will often tell him very little, and that little couched in such jargon that he may be unable to pass on any coherent or intelligible message.

As far as possible, the librarian should not seek to add further delays to the unavoidable ones. Once the system is in and working, people should be encouraged to use it. It should be recognized that unless it is run on the library's or organization's own machine this will cost money, and this should be budgeted for. People take quite a while to familiarize themselves with a system, and even longer to convince themselves that they know it. At Falkirk the staff were allowed literally to 'play' with equipment, and then structured training was followed by actual use of the equipment before the system went 'live'. Nevertheless some staff still felt inadequately prepared, although the results in operation suggested that sufficient abilities had been acquired.

Any opportunities to use similar equipment elsewhere should be seized. This may take the form of visits to other libraries; of using computer equipment elsewhere in the organization, whatever its function; and even of playing computer 'games'. Not many libraries will be able to afford to follow the example of a South African firm which, a year before computerization, assisted all its senior executives to buy home microcomputers; the general principle behind this, however, should be followed as far as possible. When on-line retrieval systems are being introduced, training courses may be included in the cost or at least be available cheaply. A limited amount of free connect-time, or some free training files, may be available for use. Staff involved in this service require constant practice; if this cannot be provided in the form of genuine searches, it must be paid for either as practice searches or by the purchase of one of the simulation packages which are now becoming available.

Some equipment — word processors and microcomputer software particularly — come with training packages built in. Staff should be encouraged to work through these, even if it means a couple of unproductive days in terms of the library's own work. Sometimes computer systems have 'training' transactions, which are cheaper to use than the real thing and are carefully designed to prevent corruptions of genuine data,
but in other respects are the same as normal operations. Full use should be made of these to allow staff to get the feel of the machine and to understand the sort of messages which they are likely to see and the commands they have to give. When introducing a circulation system it is important to have some spurious 'reader' numbers, easily recognizable if sent overdues or otherwise left in the live system. (They can be very valuable for checking the working of overdue routines and reservations procedures.) It should normally be possible to play intensively with the system and then have all the data cleared just before the 'live' use starts. As well as money in terms of payment for computer time, this takes staff time; unless it can be fitted into a known slack period of the year (and that can be dangerous; some staff may miss the training by being on leave) this time will have to be found, at the expense of backlogs, delays, and temporary diminution of the service. The alternative is a much longer period of half-speed working.

It is important that both during this initial training and in the early stages of operation senior staff take a positive attitude and encourage junior staff to be bold and confident with the equipment. Some staff unfamiliar with computers touch keyboards very delicately and hesitantly, or hold a light-pen as if it were a firework about to explode. Behind this often lies a fear of damaging equipment, in no way reduced by the arrival of that equipment in boxes marked 'Fragile'; 'Electronic equipment — do not drop' and so on. Obviously the equipment is reasonably delicate, and vulnerable to damage when dropped; so are datestamps (I once watched one disintegrate when knocked on the floor) or trays of Browne issue (I once leant on one which was overhanging the edge of the counter, with disastrous results). Physical damage is unlikely to result from normal use. Other people worry, more understandably, that doing something wrong may corrupt data, lose data, or crash the system. If the system has been properly designed, the risk of this should be minimal, and the consequences of any accident will be contained.

Worry about corruption of data often leads to the double or triple checking of operations to ensure that they really have
succeeded. This can perpetuate initial hesitation, and can produce problems in terms of users' trust in the system to which I shall return in chapter eleven. This attitude will also prevent the full exploitation of any savings which may be envisaged, and may lead to frustration among junior staff who feel that the checking is indicative of a lack of confidence in them rather than in the system. It is important to explain carefully to all staff what checking the system itself does: what errors cannot be made, and at which stage others are picked up automatically. It is vital to introduce staff to these aspects in a positive way, so that the Big Brother aspect does not recur — the machine criticizing what they do. Catalogue typists at Reading University, adapting to becoming VDU operators, were excited by the way the system checked check-digits in certain numbers and reported at once if the number was incorrect. Staff at the issue desk breathed a sigh of relief when told that the machine either read a bar-code label correctly or not at all — this after years of increasing mispunching on the paper tape of the previous system.

Nevertheless errors do occur. The system at Reading University went through a phase where any attempt to renew a book shut the system down momentarily. This caused no loss or corruption of data, but some frustration among cataloguing staff who would have to re-do amendments of which they had been in the middle. There was no chance, however, of anyone believing that data had been accepted when it had not. More worryingly, the cassette reader which records transactions when the link from the local microcomputer to the mainframe is down started to move the tape at a higher speed. The warning that a tape is full and needs to be changed is geared, in the SWALCAP system, not to the position of the tape in the cassette unit but to a standard number of transactions. Several hundred transactions therefore went unrecorded on the tape, although recorded on a printer so that they could be fed in subsequently. This was inconvenient but not disastrous, and an amendment to the standard number of transactions has now been made. Some members of staff do not trust this, and continue to make spot checks to see that transactions have been processed; one member of
staff at least is not content with checking that the last transaction has been input, but makes random checks throughout the rest of the printed record.

This raises the vexed question of how much of the working of the system should be explained to staff. In this case, it is clear, an explanation of the way the tape works and why intermediate transactions will not be dropped at random would seem to be very necessary. For other people, this adds a level of complication with which they would rather not cope; they prefer to be given a set of steps to follow, and are not concerned with the reason for those steps. The decision on what to tell people must be tailored to the individual, not to a group; as a general principle, people act better if they know why they are doing things and what is actually happening.

Above all, the process of communication must continue — only by now it must be two-way. There should be regular opportunities for the staff who actually use the system to discuss the problems they have found with each other, their immediate seniors, and whoever is responsible overall for the system in the library. This is not to rule out immediate and informal contact as and when things go wrong, but this is usually forthcoming because of the pressing need to do something when there is a fault. What often gets lost is the spreading of useful information after such an occurrence, so that other people confronted with the same problem know what they should do about it, and so that the systems librarian is kept aware of the problems even if they are dealt with in his absence. If he is acting (as he usually is) as liaison between the library and someone outside running the system, whether it be the computer centre locally, or the central site of a co-operative, he needs to know not just what is happening but how often. An occasional blip in the system is to be expected, but a frequently recurring problem, or one which happens according to some regular pattern, needs reporting and investigating.

Equally the systems librarian and the line managers will have things to communicate to staff — not just new faults which they should look out for, but new ways of using the system which have become available, or have arisen from one
person's experience. It is wrong to think that the installation of a system, even an off-the-peg package with no commitment to development, is going to be the end of the matter. For a major system it takes a considerable time to understand fully and explore all possible approaches, and even then there will be some which cannot be introduced until certain background work has been completed, or nearly so. To take experience at Reading University, the system started with staff having to do all the look-up for the reservations system. Subsequently two VDUs with access limited to enquiry transactions were installed for public use; the whole approach to reservations changed. At present only 25% of the bookstock has backup author-title entries; as this figure rises, author-title approach will become the first method to adopt. Equally, when the number of books actually in circulation without backup entries is low, it will be worth using the message indicating this to put them aside for processing; at present this would produce more books than we could handle.

Where, as in a circulation system, staff are coming into contact with the public, it is important that they know enough about the system to give intelligent answers to questions. This is not just a matter of informing people about the system — an important feature, and one which is discussed in chapter eleven — but giving an intelligent response when the system has let them down. There is a difference between saying, 'It says CPU unavailable — I don't know quite what that means' and saying, 'I'm afraid that they're having problems at the central site; we shall either be able to regain contact in a minute or we shall start recording issues locally'. The second approach is not only less likely to send readers out of the library muttering darkly about expensive systems which do not work, but it will make the member of staff in question feel more in control and less as if he or she is giving an impression of unintelligence. At a more senior level, staff will need to know the sort of delays in the system to deal with people complaining about receiving overdues after they have returned the book. Again, I have returned to this aspect of public relations later.

Finally, it must be remembered that libraries often open
until quite late with staff unfamiliar with counter routine manning the desk; that in all departments staff move and are replaced; and that staff not directly involved with a system may wish, for purposes of personal development, to learn something of its method of operation. These situations cannot be catered for in the initial training, or even wholly by refresher sessions. Nor will everyone remember everything they are told in their training sessions; often they will wish to go over it again at their own pace. While the fact that one is using a computer may immediately make one think of programmed learning packages, there is in the end no substitute for the well-written staff manual. Usually one of these will be written to accompany the initial training. If the system is being purchased, either from a commercial supplier or a co-operative, there may be a manual with it as part of the package. Some of these are very good; others can be very difficult to understand, and require a good precis or a commentary.

In any case, the manual will probably require re-writing after everyone has had experience of the system. The problems which are anticipated will not always be the ones which are experienced — manuals written on a theoretical basis will often ignore such mundane matters as how to hold a light-pen for best results. The re-writing should follow observation of the system in action to see where the difficulties occur, and analysis of the problems raised by staff at discussion sessions.

Instructions in a manual should be clear and free from jargon; there is nothing to be gained from telling the issue desk staff that the message ‘Line Failure FD’ indicates a ‘real-time executive work-block overflow’. (It is questionable how useful it is to tell systems librarians this, either.) On the basis of what is said above about some staff wanting to be told what to do and others why, it is often helpful if the actual steps to take are emphasized with background information in smaller type and inset (Figure 8.1); staff may read this later if they wish, but can ignore it if pushed for time or unwilling to attempt to understand the reasons. Above all, it must be easy to find the right place in the manual. This applies not just to finding instructions for certain procedures, which can
ACCOUNTS SYSTEM
End of day procedure

1. Ensure Printer is switched on
2. Select option M
   This produces a list of funds entered in orders which do not exist on the
   FUNDS file.
3. Select option T
   This gives the order numbers associated with an invalid fund.
4. When prompted, enter first invalid fund
   The system will list the order numbers in which that fund appears.
5. Print screen (ie shift key + "Pr Screen" key on right-hand keypad).
   This is to produce a record of order numbers without having to write
   them down. If there is only one, writing may be quicker.
6. Repeat 3-5 for all incorrect funds
7. Select option K
8. Call up and amend all relevant orders
   To amend an order, note the whole of the relevant line; insert a new line
   with the correct fund and all other details, S(ave), check details against
   former line, delete (*) former line.
9. If any of "invalid" funds should have a FUNDS record, use option 0 to
   create one
10. Select option N
    This recreates all the enquiry files, and may take some time to run.
11. Press ESCape from the menu and get prompt C>
    This takes you out of the DELTA system into the operating system for
    the computer. This enables you to make security copies of the files.
12. Type: BACKUP__C:ORDERS.*___A:
    The computer will ask for a floppy-disk to be inserted. Do NOT use the
    latest BACKUP disk — always make sure that this is kept until the new
    security copy is made.
13. Insert floppy-disk and press any key
    ORDERS may need two floppy-disks — you will be prompted to put in
    the second.
14. Remove disk(s) and label
    Put write/protect sticker on, and label disks with date, disk no (if more
    than one), and file (ORDERS).
15. Type: BACKUP__C:FUNDS.*___A:
    This repeats the same process of taking a security copy of the FUNDS
    file.
16. Switch off printer, processor, and wall sockets in that order
    Switching off in a different order may cause system problems. NEVER
    switch off the processor unless the screen is showing either a main menu
    or the C> prompt.

Figure 8.1 End of day instructions for Reading University Library Accounts System
reasonably easily be indexed, but especially to sections explaining the meaning of and appropriate action for messages which appear on the screen and are not totally self-explanatory (Figure 8.2). A member of staff not very familiar with the system will need to be able to look up 'Transaction Invalid', for example, to find out exactly what has to be done. (It should be noted that in choosing the system initially some attention should be paid to how easily comprehended are its screen messages.)

**LINE FAILURES**

**LINE FAILURE FF**
Wait for system to reset itself

**LINE FAILURE 06**
Modem failure. Go to computer and check that modem is switched on (there is a card by the computer telling you how to do this).
If still not working, phone Peter Millier at SWALCAP (0272-277609). At minimal service times go into off-line mode and leave note in Desk message tray.

**LINE FAILURE 08**
Try: REset **SEND**
Brings up TERMINAL SYSTEM CONTROL menu

Key: 1 **SEND**
Brings message MODE CHANGE — SUSPENDED MODE LINE FAILURE 08

Key: ON **SEND**
This should produce MODE CHANGE — ON-LINE
Key in REset **SEND** twice to return to terminal system facilities menu.

If it produces Line Failure 08 AGAIN, try this sequence once more.
If you get a third Line Failure 08, or if you get LINE FAILURE 03, go into off-line mode.

**LINE FAILURE 03**
Go into off-line mode. If Desk is quiet (eg at minimal service times) wait until you need to issue a book (keep returns aside) before going into off-line — the system may have reset itself.

*Figure 8.2 Instructions for procedure on receiving various 'Line Failure' messages at Reading University Library*
Often the system will allow choices — between ordering a record not available in the system and creating one from scratch, or between refusing a reader a loan and allowing him to exceed his borrowing limit. Here the manual must cover not just the way of operating the terminal but also the policy of the library in making the choices. In other words the manual must be written as a library manual and not just as instructions for operating the computer. Equally, the writing of a manual to cover all these messages which offer choices is a good method of ensuring that there is a library policy on all of them, and that staff working on their own will not suddenly be confronted with the need to set a precedent.

Which brings this chapter full circle; for just as there would be no future for a chief librarian in introducing a computer system against the combined wishes of virtually all his staff, so the computer system will not work unless the staff are trained and supported in its use. However sophisticated the system, it will require some human input and control, and it will be possible for someone to make an unholy mess simply because they do not understand what they are doing. The more sophisticated the system, the less likely it is that the mess will affect the computer records; but one member of staff ignoring the message that a book is reserved can quite ruin the library’s reservations system at a busy time. The speed and ease of computerized transactions may lull staff into becoming blasé and losing concentration. As in all aspects of librarianship, the most dangerous person is the one who thinks he knows what he is doing, and knows enough to implement some ‘correction’ slightly wrongly.

There are two further aspects to the question of staff and computer systems. One has been touched on: the relationships between staff and readers; this is dealt with in chapter eleven. The other relates to the physical conditions of work, which is a matter of considerable importance to the well-being and well-behaving of staff. This is considered in the next chapter, with other aspects of the physical installation of the system.
References

8. Hawes and Botten *op cit.*
10. Downing *op cit.* 47, 50.
Installing and maintaining the system

While the various processes of preparing staff for the arrival of the system are going on, the building has to be prepared for the equipment. When this is small — a desk-top microcomputer, for example — this may seem a minor problem and in many cases is indeed straightforward. Larger systems have obvious problems. ‘You must find a suitable room, large enough to house the computer and personnel; ensure that it is properly air-conditioned, that it has natural or “borrowed” light; also that archives of information are established in case of fire or damage; make certain the power supply is safe and above all “clean”; computers do not like fluctuating current. GPO signal lines and modems must be ordered and installed in good time’. Nevertheless the detail connected with a small system can be sufficiently irritating and time-consuming.

The first question is, of course, space. It is easy to install, say, a desk-top micro; how big a desk-top? Does the monitor sit on the processing unit? Is the latter on the disk unit or part of it? Or is the disk unit freestanding? Is there a printer, and does it have a stand? What are the lengths of cable supplied to connect all these? — are they long enough to put everything in the required location? If not, can they be lengthened or are there limitations? Is the keyboard attached to the monitor? Or has it got a flexible connection so that the monitor can be at an angle to it and take up less depth of
desk at the expense of more width? Does the printer have a holder for the output, and if not does it require a take-up table behind it? — and does the table need to be lower than the printer so that paper can fall and fold properly? All these questions need to be answered before one can even begin to look at issues of ergonomics and suitable working positions.

For larger installations the questions may be different, although some — the required floorspace, the appropriate distance for a printer and for disk-drives — differ only in the actual equipment involved. For this sort of installation, however, questions of heat output can become important. The quite significant amounts of heat produced by some equipment can cause havoc to air-conditioning systems, and if allowed to continue to heat up a room can reach a temperature at which the machine will no longer work properly — a self-regulating device which, however, is best not used! Heat disposal or dispersal can be expensive — particularly if the building is not designed to allow the heat generation to be used for background heating elsewhere. It is easiest to cope with if the computer room has an external wall. However, in today’s deep library buildings external walls — or at least ones where windows can be placed — are at a premium for allowing staff or readers a glimpse of the real world. Staff may already be looking askance at the money spent on the computer system; they are not likely to relish its introduction the more if it relegates some of them to inner darkness and artificial light. On a practical note, in modern buildings without lightwells or courtyards, external walls tend to be on the periphery; this may result in some lengthy cable runs to any terminals at the other side of the building. This, of course, may be counterbalanced if the majority of the terminals are on the same side of the building as the computer, but it may reduce overall flexibility. One must, of course, temper perfection with practicality. The ideal place for a computer ought to be the centre of the cubic structure which is the library; at Reading University that would have meant installing it in a lift stationed on the third floor!

Having provided the space, it is necessary to ensure an adequate and appropriate power supply. Again, for most
microcomputers this seems simple — they run from a normal thirteen-amp plug. A printer will require a second socket — preferably a second properly installed socket rather than a twin-outlet adaptor. Both will require the sockets to be sufficiently close for the power cable to reach, and to reach without being pulled taut. Sudden cutting-off of the power supply can corrupt data if the computer is in use, and an over-stretched cable may easily pull out of a socket. In these days of safety consciousness in offices it should not be necessary to point out that cables should not normally run across walkways or open floor; if they have to, they should be fed through a proper channelled rubber moulding. For the same reason of avoiding the problems of sudden power cut-off, computers should not be on circuits with general purpose outlets, in case a piece of faulty equipment is plugged into another outlet and blows a main fuse. If a number of sockets are on a ring with the computer socket, they should be identified and clearly marked with a warning. When the computer is being added to an existing building it may not always be known what is on the same circuit — at Reading the fact that four photocopiers shared the same main fuse as the minicomputer was only discovered when an engineer working on one of them caused a major short circuit.

Many computers, even microcomputers, are sensitive to the sort of power supply they have; in particular, ‘spiky’ power supplies cause problems. (These are power supplies in which the voltage has sudden peaks, which show as spikes on an oscillograph.) The largest computers may require wholly separate power supplies, even in some cases the provision of stand-by generators for security. This is likely to be excessive for a library installation, when a complete power cut will normally cause the building to close, and will certainly be accepted as a case for reduced services. Where power supplies appear to be a problem a ‘smoothing’ device, such as a line voltage conditioner, may be added in the circuit. The larger versions require to be wired in, and in a purpose-designed computer room one such device may be used to feed all the circuits; for microcomputers and the average minicomputer the sort which can be plugged in between the computer and the wall-socket may suffice.
Again, some of the problems of poor power supply may relate to other equipment on the same circuit — photocopiers are notorious for producing spikes on the voltage.

The installation of a minicomputer or anything larger is likely to be carried out by someone outside the library — usually the suppliers, perhaps staff from a co-operative. However, their involvement is likely to be limited to the installation of the actual hardware, and its connection to the cabling required for the various terminals. That cabling is almost certain to be the responsibility of the library (although of course it will again probably be done by a contractor). It is important to ensure that it is ready for the installation of the computer itself, and that the appropriate type of cable has been used. It must also be established what kind of plugs or sockets are to be used; which end of the cable run requires a plug and which a socket, or whether both are the same; and the appropriate pin connections. Again, the connectors may sometimes be fitted by the installation team, but it can be a time-consuming job, and may work out cheaper if it can be done by someone on the library’s or institution’s staff. It is important to have details of the connections for those occasions on which changes of layout of the library necessitate running a cable to a new site, when it will probably not be economic to bring back the installation team. Once cables are installed, continuity checks must be made to ensure that there are no faults in the cable run itself. Sometimes, if several cables have been run to the same place for a number of terminals, such checks will be necessary to identify each cable.

While still considering the room for the computer, assuming that it is more than a micro, a couple of other requirements need to be borne in mind. Service engineers will need access. First, this means that some system has to be evolved for issuing them with a key to the room — unless it is kept permanently unlocked, which may invite the more enthusiastic computer-freaks on the staff to attempt to play with the equipment. Second, the room must be sufficiently large for an engineer to work, to have access to the back as well as the front of the computer and any other equipment which is not portable, and have all the facilities an engineer
will need. The three most obvious of these are: good lighting; a table on which to work; and at least two spare power points (one for a test meter and one for a soldering iron). A worktable needs to have a top of a suitable thickness for a portable vice to be clamped to it. Also essential in such a room is a terminal or on-site printer, so that the system can be tested within the room; failing permanent provision, there should be a further spare socket and room for a terminal to be brought in on a trolley. If spares or tools are to be kept locally, a lockable cupboard for storage is essential. Some sort of telephone on the internal system is needed for those occasions on which the effects on the terminal end of a modification at the computer end need to be watched; such a telephone also assists staff inadvertently locked in the room. The facility to dial outside directly is also important for contacting help facilities, and also for engineers to contact their bases. Calls of this sort may need to be made at times when a main switchboard is closed.

One further feature should be emphasized — tidiness. This will be emphasized again when considering the problems of troubleshooting; installation is a good time to ensure that all cables are labelled at least at both ends. The tidy arrangement of cabling may seem unimportant if the number of cables is small — four or five; when it reaches the twenties it is essential. If, for any reason, cables are occasionally swapped they are likely to become knitted and following the path of a particular line can be very difficult. Plate I shows part of the installation at Reading University Library; this is the tidied version, and even in this the tracing of a particular cable is difficult. The previous arrangement looked as if someone had dropped a saucepan full of wholemeal spaghetti.

At the distal end of many of these cables will be terminals — frequently VDUs, but often also light-pen bar-code readers, OCR readers, magnetic label readers, and various printers. Most of this equipment is less sensitive than the basic processor of the computer; moreover its failure does not bring the whole system to a halt. Nevertheless, care should be taken to ensure that it is all connected in a workable manner. Poor power supplies can still cause problems for individual terminals. We discovered at Reading University that the power
Plate I Tidied arrangement of cables at minicomputer in Reading University Library
surge caused when a microfiche reader is switched on can cause some very odd responses on a Mark III Telepen run from the same socket via an adaptor. Fluctuating power can cause a ripple on the screen of a VDU, or even a slight sideways movement of the whole screen — either being conducive to headaches or nausea in the operator. Similar problems may arise from connecting equipment adjusted for the wrong frequency of current — 60 hz rather than the usual 50 hz in this country. It is important to check the settings of all equipment before connection; plugging a VDU set at 110 volts into a 240 volt power supply can be quite spectacular. In an area such as an issue desk where a lot of equipment is concentrated, the provision of two separate circuits is a sensible precaution — not only does a single circuit increase the risk of insufficient power, but it leaves the whole operation vulnerable to a single fuse.

The importance of tidying the wiring near terminals is as obvious as it is with a microcomputer — terminals are small and portable, and even if not deliberately moved can be knocked, thus disrupting power supply or interrupting the data line. While the result is less catastrophic than with a microcomputer, where whole data files can be corrupted, it is still inconvenient. Heat output, too, may be a problem with some terminals. Most have some sort of ventilation, and in normal operation the heat is dispersed into the air circulation around the terminal. Care has therefore to be taken to ensure that there is room for air to circulate, and that equipment is not pressed hard against walls, risers at the back of desks, or anything else which can allow the heat to build up.

One final feature of all installations should be mentioned — noise. The main sort of continual background noise is likely to be that of a cooling fan. This may be almost inaudible on a terminal — if indeed this has one — and quite loud on a large computer. Microcomputers, too, can be very noisy in this respect. Because this noise is constant and normally regular, one adapts after a while, but it is definitely a feature diminishing the pleasures of having a machine; the same can also be said of the resulting blast of hot air. The second most common sort of noise is the ‘bleep’ emitted by most terminals for a variety of reasons. VDUs may use it
to indicate the approach of the end of a line; reading units may use it to indicate a correct read (and perhaps an incorrect one also); both types, as well as microcomputers, may use it to alert staff to a problem — a wrongly entered message or an incompletely transaction, or a batch transaction on a microcomputer which is now finished (a signal that the computer wants more data). If possible, the volume of the bleep should be controllable — one VDU in a room may not be much of a problem, but six or more terminals at an issue desk can sound like an attempt at modern music; moreover, it is often difficult in such circumstances to identify immediately the terminal involved, which reduces the efficacy of the system as an alerting mechanism. For the same reason, some differentiation between bleeps indicating that something has been done (eg that a bar-code has been read) and those indicating a problem (eg accompanying a warning of a ‘trapped’ reader) is desirable — a difference in tone, length, or number.

Printers, too, may be very noisy. The noise can be significantly reduced by the use of acoustic covers, usually of transparent plastic. These may be available from the supplier of the printer or from independent firms marketing computer ancillaries. The larger and faster the printer the greater the noise, understandably; but some small printers can be very bad. Dot-matrix printers are among the worst, particularly the cheaper versions; the bar-code label printers used at Reading had a sort of screech which could be heard throughout the library. Daisy wheel printers have a more staccato note, like a very fast typist (which is what they are). The quietest are those using a heat process, but they are not always the best in terms of quality of output, and they require special paper. A large printer capable of producing reams of overdue notices and catalogue records really needs to be kept away from where people work. With word processors the printer probably needs to be near the keyboard so that the operator can watch the output; with microcomputers the length of the supplied interface cable usually ensures this, and with electronic typewriters one normally has no choice.

Where the system is part of a larger network — a co-operative, or even a user of on-line databases — or where the library is multi-site, telephone lines will need to be installed.
The removal of the British Telecom monopoly may ultimately produce competition in this area, but a number of the same problems will remain. Telecommunications lines are often the weak point in a system, the area most liable to breakdown. PW (Private Wire) Lines, often known as ‘hard’ lines, which run direct from computer to computer or terminal are more reliable than ‘dial-up’ lines, but even they can cause problems. Whichever sort are appropriate it is essential to avoid running them through internal switchboards, where they might be inadvertently cut off. This may cause political problems within an organization, especially where dial-up lines are used, because it means direct lines to the outside world not regulated by the switchboard operators.

Timing is all-important. There are often delays in the installation of telephone lines — six months in the case of Hatfield Polytechnic. Often with long distance lines installed by British Telecom, the problem is one of communication between their various areas — the line is laid but no one has tested it or made the final set of connections. The problem can, however, occur on a more local basis, as was proved by the delay of ten weeks in installing lines from the main university library to the education library at Reading. Within London, even short distances can involve a number of exchanges — the connections between the various sites of the Polytechnic of Central London run through at least three exchanges although all the sites are within about a mile of each other.²

The lines need to run to some sort of communications equipment, usually a modem. These come in various shapes, sizes and speeds. The speed of line — measured in ‘bits per second’ (bps); 1 kilobit per second is approximately 100 characters per second — obviously affects the time taken to carry out various operations; faster speeds can usually be obtained on permanent lines than on ‘dial-up’ facilities. Where the lines connect a computer to a terminal, as in the case of outlying branch libraries, modems are not always necessary; instead, line drivers which amplify the signals may be installed at each end of the line. While most of this equipment will — at least initially — be installed by engineers from suppliers or central sites of co-operatives, there may be times
when library staff need either to connect or to change the equipment. Among the problems which can occur is the difficulty of identifying pairs of wires for transmission and receiving of data. Some line drivers require connection not just of the receive pair at one end to the transmit pair at the other, but specific connection of pin to pin; at times it can take over an hour to work out the various permutations, depending on the test equipment available.

Assuming that all connections — data and power — have been suitably provided, the problems of installation are by no means at an end. The placing of terminals, especially VDUs, requires careful thought — some of which must be done before the connections are run! With VDUs the prime considerations are those of reflection and glare (Plate II). Glare from the screen itself can be controlled either by the brightness control fitted to most VDUs or microcomputer monitors, or by the fitting of some sort of filter. Of the latter, the cheapest is a simple black mesh, while the most expensive are polarizing glass. Filters have the added advantage of cutting down (or in the case of polarized filters, eliminating completely) reflections of other lighting from the screen. Both excessive glare and large-scale reflection can force people to stare very hard at the screen, and this is the cause of many of the headaches and eyestrains associated with VDU work. To minimize these problems, VDUs should be placed carefully in relation to room lighting. The Health and Safety Executive have made recommendations about this.³ When the terminals are being introduced into existing buildings these recommendations may be difficult to implement; even in a new building Newcastle University Library has found it necessary to put up curtains round its main bank of VDUs, and to use mesh filters over the screens.

The HSE report also stresses the importance of appropriate seating height. This is less specific to the use of computer equipment, as any typist would agree, but it becomes important as part of the psychology of introducing computers — the less strain one can put on staff, and the fewer actual aches and pains that can be definitely associated with the new equipment, the better. This means that money may need to be spent not only on the terminals themselves but also on
Plate II Problems of cables at an issue desk not designed for computer equipment (Reading University Library). Notice also the reflected light, and the mismatch between terminal and desk width.
new typists’ chairs and new desks. VDUs put onto a normal typing desk can be a little cramped, and the need to work with 132 column print-out can mean that more space needs to be provided at the side of the terminal for the work being copied — meaning basically a wider desk. Often some mobility may be required for this desk, since a terminal may need to be used in a number of different places. Now that keyboards and monitors are frequently separate pieces of equipment connected by a cable, use can be made of the sort of desk which has a raised portion for the monitor and a sunken part for the keyboard.

Some of these questions really relate to the purchase of the computer equipment. Points to look for if possible are: adjustable screens (usually three possible positions); good brightness controls; and the sort of ‘ergonomic’ keyboard which has an adjustable slope, and at its lowest adjustment is almost horizontal. These features promote comfort in the operator and therefore increase the acceptability of the machine. The adjustments are needed both to cater for different operators and to give an operator some degree of control over his or her own environment.

Environment is another keyword. For some tasks there needs to be reasonable protection from distraction, audible or visual. On-line searching is one such task, where the searcher needs to concentrate in order to avoid time-wasting and costly spelling mistakes or mistakes in combinations of terms. Questions of heating and ventilation of course apply to all areas where staff work, but the heat output of some computer equipment may necessitate giving a little more thought to this aspect. Equally the concentration required of someone staring at a VDU screen for large parts of the day perhaps justifies a better working environment than is provided for staff in general. Thought must be given to the provision of anti-static mats near computer equipment, although these days the heavy use of plastic in terminals, and generally better construction has reduced the cases of staff getting shocks from terminal equipment.

The ergonomics of terminal use need to be studied. The HSE and Work Research Unit publications already referred to cover the ergonomics of office-style usage, which covers such
library functions as catalogue input and accounts as well as word processing. The ergonomics of computer equipment at the library issue desk still needs more study, some of which is now being carried out at Birmingham by Susan Grey. As librarians who have had to install computer equipment onto existing desks will know, VDUs do not always sit happily across a desk; moreover, if books are to be handed across, the VDU must be to one side and at an angle. The back of a VDU is not only usually unaesthetic (this is less true of purpose-built library terminals such as those made by GEAC) but also has exposed plugs which may tempt idle queuing readers to fiddle. One answer may be to put an upstand on the desk to keep the back of the equipment hidden; another solution is to put the terminal on a stand at right angles to the issue desk proper.

Equipment other than VDUs may need to be inset into desks, rather than stood on top, or housed under them. This can provide problems if equipment is to be moved; Newcastle University Library has a removable fillet in each of its desk modules so that the existing equipment may be inserted neatly into the centre of any module. Problems of ventilation may also arise — the SB Electronics 'minipen' units at Reading were at first fitted too close to the underside of the desk top, and reached a temperature above their working temperature. Fitting beneath desks, while neat in appearance, must be carefully done if it is not to result in bruised knees or laddered tights.

With light-pens or OCR readers there can be a problem of what to do with a trailing cable. GEAC appear to have solved this by putting the 'decoder' into the somewhat fat light-pen, which is connected to the terminal by a spring-coiled cable. Other makes of equipment are connected by fibre optic cables which cannot be bent too tightly. There can be problems in all systems if staff are not uniformly right-or-left handed; a VDU on the correct side for one will involve the other in more awkward movements. This is an argument for keeping VDUs at issue desks as mobile as possible. Another form of mobility is required at enquiry desks, where it may be important for the reader to be able to see what is on the screen. Possible solutions to this are again siting the terminal
at right angles to the front line of the desk — which with the detached keyboards available today does not necessarily involve the enquiry staff in either sitting themselves with their shoulders towards the readers or performing contortions to type in requests; mounting the VDU on a turntable so that it can be swung to face the enquirer; or using a monitor. The latter is expensive (monitors can easily cost as much as a cheap TV set without the facility for receiving Play School) and equally can lead to a very impersonal relationship between staff and user which I, certainly, would wish to avoid.

Overall, the keynote for installation of computer equipment should be, as with library design in general, flexibility. Computers change the operation of libraries, and it is no help if their installation brings a rigidity which prevents that very change or any subsequent modifications from being carried out. This means that where possible power and data cables should be run in trunking, and that there should be a grid of trunking covering the whole area in which they might ever be needed. Clearly this is not always feasible in existing buildings, but wall-mounted trunking can be something of a substitute. As far as possible the running of cables not in trunking to a special floor socket or opening for each terminal should be avoided. So too should cabling running uninterrupted along the length of a modular desk — connection by cables can destroy the modular flexibility. (I have heard of an architect who wished to run an armoured cable the length of such a desk.)

Equipment, as I have said, goes wrong; it is essential to have maintenance agreements. Hardware maintenance probably causes some of the worst problems in any computer installation. There are no hard-and-fast rules about what to do: caution might say go for an agreement with a large, national firm but sometimes a local firm may respond more rapidly to calls. Often there are two types of agreement; one for rapid response (within 24 hours at least) and one for less rapid attention (within seven days). The latter is often much cheaper, and is suitable for contracts on the maintenance of terminals in a large installation where the failure of one terminal to work does not bring all operations to a complete
stop. It may be that the difference between the two types of agreement is sufficient to pay for an extra ‘floating’ terminal which can be swapped with the faulty equipment. This is undoubtedly the best system — it provides immediate replacement, and therefore better by far the engineer arriving even four hours later.

However, it is not a system which can be adopted for all equipment. A single installation cannot afford to carry spares for all parts of the computer; it would mean, in effect, holding an entire spare machine. Equally it is important that the response to fault calls on the computer itself is as rapid as it can be for, unlike a single terminal, that will bring the whole system to a halt. Naturally, where the computer is not dedicated to library use the question of maintenance contracts will be decided elsewhere (although the librarian should ensure that the importance of the machine to his service is recognized); moreover there may well be a fairly high degree of engineering expertise available locally. If a number of machines of the same type are being operated, there is a chance that spares will be carried, or that the appropriate board can be taken from a machine serving a less urgent function.

The local expertise may well be available, if slightly less readily, if the library is operating on its own dedicated computer. Equally even library staff can, and probably will, build up a certain amount of expertise if involved with the system for any length of time — I have considered this aspect in chapter ten. This is an area in which membership of a co-operative can be very helpful, for quite detailed help may be available at the end of a telephone, and for those occasions when the problem is without obvious cause (about 60% of computer problems) there is a pool of experience which may enable the pattern to be recognized and a solution found. Certainly I have found discussions with colleagues in other libraries of great help. This will be true even of those who are not members of a co-operative as such but who use the same equipment, such as the libraries who run some variant of the GEAC system.

Equally, of course, a co-operative may, because of its size, have more influence with maintenance firms; although
against this it rules out any opportunity of using the small local, efficient company. Because it pays the co-operative to have all its maintenance done on one basic contract, it is unlikely that there will be any options open to members regarding maintenance. The employment of its own engineer is an option open to a co-operative without necessarily creating economic strains; just as they can also afford to purchase a complete set of spares for the system’s standard computer — one extra machine between twenty libraries is not unreasonable.

 Whatever sort of contract is adopted, it pays to have as much as possible of the equipment maintained by the same firm. Sometimes specialist equipment, particularly if it is widely used as in a co-operative, will be maintained by the manufacturer. The suppliers of terminal equipment are usually willing to arrange long-term maintenance, but where equipment is coming from various sources this can be dangerous. I have already pointed out that many computer faults are difficult to pin down, and nowhere is this more so than in the question of interfaces between two pieces of equipment — for example a VDU and an attached serial printer. Failure of the printer to print may be the fault, *inter alia*, of the printer itself, the connecting cable, or the printer port on the VDU; unless one is able to test the printer with another VDU, or the VDU with another printer, an engineer can only pick one place to start, and check all the way through until a fault is found (or until the printer starts to work again!). However, if there are separate contracts for printer and VDU, there is a natural tendency for engineers to make only a little exploration before announcing the other equipment to be at fault. I have on one occasion had to arrange for two engineers to arrive at the same time (no mean feat) to settle a dispute in which each claimed the correct functioning of his own responsibility. It helps if the same engineer, or at least the same firm, is responsible all down the line.

 The only complication which may be involved when the maintenance contract is arranged other than with the supplier or manufacturer is the question of warranty. Most computer equipment is sold with at least six months’ warranty, and
unless a library has money to burn such equipment will not be added to the maintenance contract until the warranty has expired. However, this means that someone (probably the systems librarian) has got to arrange for the appropriate additions at the right time. Again this may be something the institution’s or firm’s computer manager may be persuaded to do, although he is unlikely to undertake this unless the orders actually pass through his hands. In a cooperative this may also be undertaken by central staff. Even if it is, of course, someone in the library will need to remember which pieces of equipment are under warranty and which under maintenance, and ensure that the appropriate firm is contacted. Although not difficult with the first initial block of equipment, life can become complicated as terminals are added piecemeal, and swapped around into the bargain.

One final point which may seem obvious is to ensure that the maintenance firm has adequate staff trained in the maintenance of the type of equipment concerned. A firm specializing in computer maintenance will at times undertake work on a number of makes of equipment, and may lay claim to expertise scarcely possessed in the hope of landing a contract. There needs to be more than one person able to deal with the equipment in question in order to cover for leave or sickness. I confess that my heart sinks somewhat when an engineer pulls out a manual and begins to read from page 1. Not only is he unlikely to be able to spot the odd freak which is causing the system to fail, he may actually do something completely wrong and crash the whole machine. Reading University Library spent three days with its computer totally out of action when an engineer had attempted to repair a fault affecting only one of the twenty-four channels. Having stated that a sufficient pool of knowledge must exist in the firm, it is nevertheless helpful if their organization is such that it is normal for the same engineer to come. This enables him to become familiar with the system as it is used (with any modifications to the manufacturer’s original specification), to get to know any idiosyncracies of a particular machine, and to establish good working relations with the staff.
Because equipment may fail, it is important to have some safeguards relating to the data, for while some failures simply freeze the computer in whatever state it happens to find itself, others will actually destroy or corrupt data which have been recorded. The two most common causes of this are power supply problems and disk head-crashes. When this sort of thing happens, it is necessary to recreate some or all of the database, which means that this has to be copied at intervals. There are various approaches to this, depending on the size of the system and the type of data. The general principle is that the whole database is copied periodically in machine-readable form, and the transactions since the last copy are logged in some form so that they too can be fed back in. In its simplest form this logging may be the input forms, which will be stored until the next copy of the whole database is made. In more sophisticated versions all transactions may be written to a second disk drive or to tape, simply as transactions and not as modifications to the database, so that they exist in machine-readable form to update the last copy of the whole. Some attempts have been made to run the system in parallel — this was indeed the initial intention in Derbyshire, where two Prime computers were to run in this fashion. This is based on the assumption that it is unlikely that both machines will be afflicted with problems simultaneously.

Such experiments have not been continued in libraries. They are an expensive method of ensuring security, and the belief that lightning does not strike in the same place twice is not scientifically proven. All questions of back-up are a matter of balancing cost against risk — they are, in fact, matters of insurance and operate in precisely that fashion. The two important questions are, how long does it take to make the copy, and how long will it take to re-establish the system? In the case of a microcomputer, there is a third question: does it have to be ‘minded’ while the copy is taken? It may take up to ninety minutes to ‘back-up’ a 10 megabyte hard-disk onto floppy-disks, but the problem is not the time but the fact that someone needs to keep changing the floppy-disks in most machines. Alternatives do exist: most microcomputers can back up onto tape (it takes much longer).
Faster tape-readers may become possible; and this process usually only requires the occasional eye cast over it. Equally it is possible to have a second disk-pack to back up the first, a process which takes a few minutes and requires no operator monitoring. The danger is that a second set of fixed disks in the same machine could suffer whatever fate befalls the first. It is likely that 5MB Winchester disks will become available for some microcomputers (eg the IBM Personal Computer) in the reasonably near future, and these will be both speedy to use and secure in that they can be removed for storage.

Larger installations will have more sophisticated equipment, but equally a larger set of data to handle. It becomes even more important in these cases for the operation to be largely automatic once it has been set in motion by staff — as in the Polytechnic of the South Bank. This is less of a problem, of course, if the computer is sited where operators are likely to be available — either in a computer centre or at the central site of a co-operative. In installations of this size it is important to log transactions in machine-readable form — especially when a circulation system is involved; no one is happily going to key in several hundred, or perhaps several thousand, transactions completed since the last security copy. In a co-operative, indeed, security copies will probably be made more frequently than the standard once daily; conversely in very small operations every two or three days will probably be sufficient. (For example, in Reading’s accounts system we shall probably take copies only when we are about to send invoices to the finance office — a couple of times per week — and therefore will no longer have the basic documents from which to recreate the data.)

The speed at which a security copy can be fed back into the system, and subsequent transactions input to bring it fully up to date, is something which should also be considered. Should the system crash and need to be recreated, housekeeping operations such as cataloguing will have to stop, and if service to readers at a circulation desk is maintained it may only be in some sort of back-up mode — even hand-written lists. Certainly a full reservation service will not be available, nor will on-line checking of the status of readers. The
importance attached to the speed of recreating the system will depend very much on the type of system offered; it is always going to be a faster operation for a single library than for a large number of libraries in a co-operative — one area in which co-operation does not necessarily bring advantages. A further consideration which must be borne in mind is that the restoration of the system, if it is a lengthy operation, may extend beyond library opening hours. Operators in a computer centre are more likely to have arrangements to cover this than are library staff.

It should not be assumed from the space spent discussing hardware faults and security copies that systems are regularly crashing like the fall of leaves in autumn. Most systems are very reliable, and in many places the calling of an engineer is a fairly unusual event. There is, however, rogue equipment — the computer equivalent of a Friday afternoon car — and there are rogue sites (these are often related to power-supply problems). The costs of maintenance agreements and providing good back-up are not small, but neither is the insurance of a house — or a library. Few libraries have been destroyed by fire in the last decade, but we shell out happily because we know that if we were it would cost a fortune to replace our stock — even given that some would be irreplaceable. Back-up tapes and maintenance contracts provide the same hedge against a disaster at once more minor but more likely.

Also associated with the installation of computer systems is the need to have ready the necessary ancillary equipment and stationery. It may seem incredible, but it is possible to order a label printer and to forget to order labels; it is certainly easy not to realize the necessity to order stationery with the appropriate number of labels across the page, for this may depend not just on the size of the printer but also on the program by which the labels are printed. For normal listings, paper comes in various widths, with or without sprocket holes, and for some purposes — fast printing of letters on a word processor, for example — the sprocket holes are on a perforated strip at each side, which can be torn off to leave a normal sheet of A4 or whatever size is required. Sprocket-holed stationery may be lined or plain, and for
some internal listings it probably makes sense to re-use paper already printed on one side. Printers also require (some seem to eat) ribbons, and each type of printer seems to need a different sort of fitting. Ribbons too can come in a variety of types, from the standard inky sort to carbon ribbons and 'multi-strike' ribbons for word processors and text editors. Often these need to be experimented with to find the most suitable type.

Floppy-disks and cassette tapes equally do not materialize out of thin air. Normally one can rely on a supplier of a computer to bring (for sale) a reasonable initial number of these when the equipment is supplied, but it is well to be sure of this. Less obvious items are laminating machines and laminating pouches for protecting readers' tickets — it can be forgotten, if the tickets are being produced elsewhere, that they may not come laminated. Storage for floppy-disks, cassettes or print-out has also to be arranged; in the case of print-out this is dependent on the size and type of paper used. Cassettes may need erasing, in which case a suitable magnetic eraser must be purchased. If an issue system is being changed, and it is not proposed to transfer all existing loans to the new system but rather to return them via the old system, some variation in type or colour of datestamp may be needed to indicate which system holds the records (particularly in libraries where different categories of borrowers have different loan periods, so that the date due is no indication of the date of issue).

Also easily forgotten is the need for appropriate stationery for data input. This has to be a part of organizing the use of the computer in the library, and there are dangers in getting vast quantities of stationery printed initially; often the first six months of operation will cause re-assessment of the stationery needed and its layout. On the other hand, there is a (possibly spurious) feeling of greater efficiency about having printed stationery rather than badly duplicated forms; more importantly, printing allows the use of a background colour, such as green, against which written-in data will stand out. Perhaps the best compromise is to duplicate or photocopy the first set of forms, until a satisfactory arrangement is achieved.
The design of such forms will obviously depend on what the system is to do and how it operates. Ideas may be gained from libraries seen on the visits suggested in the previous chapter, and permission may be given to copy these as a starting point. Forms may be needed to list ISBNs of incoming books, together with other data to be put in the record, or the input may be done from the books themselves. Data capture forms for issues and returns when the system is down may or may not need to include date and time. In producing forms for creating catalogue records, it may be thought worthwhile to prompt as to MARC coding, or to give reminders of the significance of certain subfields; some elements may be standard on all forms, and can be printed. As to the layout of the forms, this should if possible reflect the way material is input: it is a waste of time for a keyborader to be jumping backwards and forwards across a form. Forms have sometimes to serve more than one purpose, and the logical order for one may not be that of the other. It is to be hoped that any library system will be so arranged that it deals with bibliographic data or other elements in roughly the standard order used in most libraries; this should prevent too many conflicts between form-filling and keyboarding. There are occasions however in running mixed manual and computerized systems when the need to file cards which are being used as input forms means that the filing element appears out of its normal sequence. If the computer system being used allows for the creation of input masks, it may be possible to make the input reflect the form; if not, it may be easier to repeat the filing element than to make life difficult for the keyborader.

Users will require stationery also, and here again it is important to work out how they fit into the system as a whole. As always, stationery for users requires, if anything, even more care than that for staff, who may be expected to have some understanding of the working of the system. Readers will need ways of requesting the reservation of books, and finding out what books they have on loan; these things may be possible to do on-line, but this may not always be the most practical or sensible response. The system may only accept reservations for books recorded as on loan;
the library may wish to accept reservations for books which readers simply cannot find. Some readers, in academic or special libraries, may have a large number of books on loan which makes an on-line response uneconomic; such readers, and often others too, will want a printed list to take away.

Readers will also wish to join the library, and while an academic library may be able to create a basic registration file from UCCA tapes or other administrative records, this is not an option open to public or (usually) special libraries. Where computer-based telephone directories are in use, they may provide details for the registration file. In many cases, however, staff will need to register all users individually, and this is better done by getting readers to fill in cards which can be batched than by asking them either to key in details at a terminal or to dictate these details to a keyboarder. It should also be remembered that while the direct input of data to a terminal will give the system all it requires to operate, there is as yet no cheap way of entering a signature on a terminal to show that a reader has agreed to a particular undertaking. For this reason, as well as to cope with students or visitors not on administrative tapes, even academic libraries may well continue to use a registration card even if it is not used as an input document.

Equally there are, alas, times when readers default and need to be put on some sort of interception list or trap. Not all systems give sufficient space for full details of the offence to be entered, and it may be necessary to keep these in some sort of manual file; policy may also dictate this, since it is sometimes easier to keep track of who has access to a manual than to a computer file. (This practice may become still more widespread with the introduction of the Data Protection Act.) Such cards need to be organized so that it is clear to the staff member dealing with the reader not only what the problem is but also how to go about lifting the restriction if it is solved.

Once the system is installed, it needs to be tested. Whether or not it is run in parallel with the previous system will depend on a number of factors: what functions the system performs, how vital it is that the records are accurate and how easily everything can be re-created; what state the old system is in; how easily both systems can fit physically beside
each other. With the introduction of an accounting system it is important that it works, and works accurately, before the old manual records are discontinued; at Reading University Library the problem of parallel running was coped with—just—by back-entering data for the first three months of a financial year in a brief form, and checking the output with the manually-produced balance for the same period. In the case of the circulation system, however, the existing system had become very unreliable; it would have been difficult to put Telepen equipment on the desk which housed the ALS card readers, and readers could not have been expected to wait the extra time while books were, effectively, issued twice (not to mention the problems which might have resulted had library staff failed to return them twice). Since the SWALCAP issue system was already working satisfactorily in other libraries, it seemed justified to move to it completely.

However, even if running in parallel is not practical, there needs to be a training period before the system is used 'live', as discussed in the last chapter; this provides an opportunity for a fairly thorough test of the workings with dummy data. It is important in any testing with dummy data that the test files really do contain examples of all the possibilities which can be anticipated. In the case of a circulation system this means experimenting with trying to issue a book twice, or to a reader who has not reserved it, and all the other attempts at infringement or misunderstandings of the systems by users which can be imagined. In the case of cataloguing systems it means ensuring that there are several examples of every conceivable type of entry—corporate authors, government bodies, conferences, subject and series analytical entries—so that not only the layout and content of entries can be checked but also the filing order. Inputting such a test file can show up difficulties in the input, and possible confusion or likely mistakes on the part of the keyboarder.

Finally, it remains to repeat what has been said before, that instructions need to be written. Obviously instructions must be written before the training period commences, but a careful monitoring of the difficulties encountered during that period will ensure that the instructions will cover most of the
situations likely to arise, and that the right aspects are emphasized. The instructions, whether for library staff or users, should be written in English, not jargon — it may take a few extra words to say, but it will save time in subsequent explanations. The same applies to instructions on how to cope with running problems, which is the subject of the next chapter.

References

2. Collier, Mel and Piper, David 'Multi-site library networking: experience of the Polytechnic of Central London'. *Program* 18 (2) April 1984. 147-57; 154.
4. *Vine* 49 August 1983. 34.
6. Hawes and Botten *op cit*. 53.
10
Coping with—and avoiding—crises

Unfortunately, there is more to keeping a computer system working than ensuring that you have a good service contract and making a telephone call every time something goes wrong. Leaving aside the question of whether twenty-four hours (a fairly standard ‘guarantee’ response time for service contracts) is a feasible time when it may mean a full day with no issues, returns or reservations recorded, no cataloguing done and no books ordered, it has to be admitted that there are times when twenty-four hours seems to stretch rather longer. Engineers are not conjured up by rubbing a circuit board; they may have to travel some distance, and a small firm may not have many of them, so that one might have the temerity to be working on someone else’s machine at the critical time. Even the larger firms employ (for obvious economic reasons) the minimum number of engineers they think can cope with expected demand, so that holiday periods, sickness, or a coincidental series of breakdowns (perhaps after an unusually bad thunderstorm) can find them over-stretched, with consequent effects upon their speed of response.

Moreover, some of the firms specializing in maintenance service many different types of equipment, and many of their engineers will be specialists in only one or two types. Thus it may be possible to provide an engineer, but when he arrives
he may need to start almost from scratch. Even if the engineer is quite at home with the equipment, he may discover on the first visit only what is wrong, and need to come a second time with the appropriate replacement part — having tracked this down in some remote part of the country. Maintenance firms’ records of precisely what equipment is used at a site can be less than perfect, and sometimes maintenance firms appear to have problems in obtaining spares, circuit diagrams and so forth where the manufacturers offer their own service scheme.

For this reason and others, although the advantages of having all equipment serviced by one firm were stressed in the previous chapter, it may not prove possible. Some manufacturers will not allow anyone else to service their machinery; in other cases the equipment is so specialized that no one else wishes to service it, or would have the ability. Sometimes a maintenance contract at very favourable prices will have been thrown in with the purchase. Some equipment may be under warranty from a supplier while the rest is on maintenance contracts. British Telecom links from one site to another are entirely in the hands of British Telecom, and while the breaking of the monopoly may allow others to establish such links they, too, are likely to keep the maintenance firmly in their own hands. (Rightly so: apart from not wanting every Tom, Dick and Harry digging up the roads, many circuits are run close together — perhaps on the same cable if wide-band systems or fibre optic cables are being used — and all the servicing on a particular set of cables has to be in the hands of one agency to avoid undue interference with other cable users.)

For all these reasons, it is clear that someone, at least, in the library needs to know something about the system and its hardware in a technical sense, at least sufficient to know which piece of equipment has failed and which engineer to send for. Clearly it is advantageous if he or she can give some idea of what has actually gone wrong — it is even possible that an engineer may arrive with the appropriate spare. At times of real crisis — where the whole system is down — the ability to effect a moderately straightforward repair, even if temporary, can be a godsend. (This is not by any stretch of
the imagination an aspect of professional library work, but it may be a very important factor in offering a service to users.) Where the library has systems staff specifically appointed, they may be expected to assist in this area; Peter Gratton describes his computer liaison officer ‘carrying around and using pliers, soldering iron, electric drill and screwdriver’.

It is surprising what untrained staff can do, and what resources can sometimes be called upon. At a time when the ALS systems centre had completely stopped working in Reading University Library, the fault was traced to a particular relay by the deputy librarian looking for signs of heat damage. A circuit diagram of the relay was found in a data-book by the administrative assistant (a former central heating engineer), and a temporary repair was carried out by an engineer who had come to service the photocopiers, and who was a regular visitor frequently plied with cups of coffee and occasionally taken off for lunch in a pub. (Any good engineer is an asset to be cultivated.)

Not all library staff take to the technical side of computers, even if they can be cajoled into accepting their use. For some, the computer never loses its magical overtones, its status as a sort of unpredictable Puckish creature which works or not entirely at its own whim. For such people, the idea of trying to track down a fault either has a sense of _lèse majesté_ or begins with the pessimistic assumption that because they do not understand how it works they will never be able to find the problem. Even those staff who _do_ know something about computers may spend so little time dealing with the hardware that when things go wrong they are unsure where to start. The basic necessity, therefore, is to have a full description of the system, and a clear guide to fault tracing. This is true even if the system is a simple one-terminal microcomputer — there are plugs which must be plugged in if the system is to work, and it is important not to assume that knowledge of this is God-given and resides in every human brain. A significant number of computer ‘failures’ can be attributed to blown fuses and badly-soldered contacts.

When the system is a multi-terminal arrangement, perhaps with remote sites and telecommunications links with modems
and for line-drivers, clearly rather more elaborate instructions are needed. In one respect testing may be easier than with a single micro, for the chances of replacing one piece of equipment by another to test the first are generally increased. However, doing this involves knowing something about the types of equipment — what is and is not interchangeable — and being clear while standing by the computer which line leads to the relevant terminal. To illustrate the sort of problems which arise, let me describe the terminal system at Reading (figure 10.1).

Each terminal channel is identified in the software by a letter (indicating the type of equipment — VDU, Telepen, etc) and a number. On accessing the transaction ‘Terminal System Control’ at a VDU, that VDU will display its channel number. However, the two public access VDUs are inhibited from using that transaction, and there is no way of displaying the channel number on a Telepen unit. (As these channel numbers are required for statistical purposes, they have to be discovered and recorded.)

Actually at the minicomputer, there is no way of associating a channel with a particular output board or pico processor without connecting a VDU to it and using Terminal System Control. All the output boards do, however, have numbered sockets, and the boards have been allocated letters; thus the physical output channel may be described as C5. A list is kept of channel numbers against hardware numbers. After two years of increasingly problematic tracing of cables from the output board by groping amongst an ever-growing nest of spaghetti, all the intelligent cables were labelled, on the pico processor and by the final output socket, with the relevant hardware output number. By the final socket they were also labelled with the software channel number, which remains constant for a particular output unless the program is radically changed. Thus the list is now only a back-up: the relevant cross-referencing is actually available on the machine. All lines leading from there to terminals are numbered at each end, so that even if the terminal’s channel number is not known it can rapidly be followed back to the appropriate connection at the computer.

There are two sorts of plug used to connect cables to the
### Terminal Configuration

<table>
<thead>
<tr>
<th>LSI 2720 CPU</th>
<th>TECHTRAN DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER FAIL RESTART</td>
<td>TELETYPY</td>
</tr>
<tr>
<td>BASIC VARIABLES</td>
<td>CASSETTE 815</td>
</tr>
<tr>
<td>REAL TIME CLOCK</td>
<td>43</td>
</tr>
<tr>
<td>AUTO LOAD</td>
<td>DATA LOGIC MODEM</td>
</tr>
<tr>
<td>TELETYPER EIA INTERFACE</td>
<td>SWALCAP</td>
</tr>
<tr>
<td>OPTION</td>
<td></td>
</tr>
<tr>
<td>32K RAM MEMORY WITH BATTERY BACKUP</td>
<td></td>
</tr>
<tr>
<td>SYNCHRONOUS MODEM CONTROLLER</td>
<td></td>
</tr>
</tbody>
</table>

#### 4 CHANNEL IOC (A)

| CH 4 | 9600bps |
| CH 5 | 9600bps |
| CH 6 | 9600bps |
| CH 7 | 1200bps / 600bps |

#### 4 CHANNEL IOC (B)

| CH 4 | 4800bps |
| CH 5 | 9600bps |
| CH 6 | 1200bps |
| CH 7 | 9600bps |

#### 8 CHANNEL IOC (C)

| CH 0 | 9600bps |
| CH 1 | 9600bps |
| CH 2 | 9600bps |
| CH 3 | 9600bps |
| CH 4 | 1200bps |
| CH 5 | 1200bps |
| CH 6 | 9600bps |
| CH 7 | 9600bps |

#### 8 CHANNEL IOC (D)

| CH 0 | 9600bps |
| CH 1 | 4800bps |
| branch 1 | |
| CH 2 | 9600bps |
| CH 3 | 9600bps |
| CH 4 | 9600bps |
| CH 5 | 4800bps |
| branch 1 | |
| CH 6 | 9600bps |
| CH 7 | 9600bps |

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Figure 10.1 Terminal system in Reading University Library
minicomputer: DIN and EIA. Fortunately there are two VDUs local to the mini which have different plugs, so that one or other can always be connected to a suspect channel to check if the output is correct at the computer before testing the other components. The rest of the testing works in the same way: different terminals are connected at the end, and then a different cable can be plugged into the offending channel, until the fault is isolated. Often equipment is close enough together to make this relatively easy, although with only three Telepen terminals some transport of them around the library becomes necessary. The Minipen terminals can simply be taken out of circuit, but if it is felt necessary to check them by swapping, the fact that there are only two appropriate circuits can be a nuisance.

It is, however, important to counter check all indications that a piece of equipment is not faulty. It is not enough to replace it and find that the replacement does not work on that channel either — the original must be checked on a working channel. The coincidence that there are two separate faults happens more frequently than one might suspect, and cutting corners can lead to worse problems. This is illustrated by a recent occurrence at Reading. Two of three lines to the education library failed shortly after a rather troubled installation. One line driver was replaced by another known to be working; the line still did not work. The line driver at the other end was replaced also; the line still did not work. Both line drivers from the non-working lines should have been attached to the working line, but were not because of the time taken to connect them into the circuit; equally both channels should have been tested with the replacement line drivers in circuit, but only one was. A line fault was reported to British Telecom, who discovered that for no explicable reason one pair on one line had been reversed; this was rectified, the line connected to the original line drivers — and it still failed to work. One line driver was replaced, and the line still did not work. At this point one of the staff at SWALCAP happened to remember that another site had had line-driver problems following a thunderstorm, and that there had recently been thunderstorms in the south of England. Appropriate service calls were made, and it later transpired
that as well as the reversed pair on one line (which accounted for the apparent failure of two working line drivers to work the line) both line drivers had been damaged during weekend thunderstorms.

However, apart from listing — and where possible showing people — the way to go about testing which item of equipment has failed, it is important to help them solve the problem if it is the sort of thing which can be corrected locally. Staff unused to the computer may end up calling an engineer for a minor fault — which is a nuisance, if it remains a fault until an engineer comes despite being easy to correct locally, and may, if it happens to any extent, increase the cost of the service contract or decrease the sense of urgency with which engineers respond. It is more likely, however, that such staff will fail to call an engineer when he is needed because they are afraid that the fault is a simple one. There is no way to give staff the courage of their hesitant suspicions, but it may assist if the symptoms of easily soluble problems are described, and they are told that for anything else they should call an engineer. The sort of problem that gives rise to this dilemma is the output of rubbish on a VDU. In our circumstances this could be the result of a wrong receive speed setting; of a wrong receive parity setting (this gives rise to a particular sort of garbage involving exclamation marks); of the switching on of the programmable keys on the numeric key pad. All these are simple to correct from the keyboard. It could result from a fault in the minicomputer memory which could be cleared by restarting the computer, or by reloading the full program down the line — again simple to do, although some staff will jib at actually touching the computer. It can also result from a loose connection at the output board, or from a fault on the board itself. Because even the re-seating of a plug on the output board can involve loosening two or three boards in the minicomputer, it is perhaps best left to an engineer, although one or two staff may be capable of solving it if they are around. The replacement with a spare of course involves an engineer.

Another aspect of troubleshooting which this illustrates is the importance of watching the engineer, or at least getting him to explain what he has done. Until I had seen boards
being pulled in and out of the computer, I should never have dared to attempt it myself. Equally, it is impossible to anticipate all the faults which might occur which could be corrected locally. The only thing to do is to note down such faults each time they occur, whether repaired by a systems librarian who guesses correctly at the cause, or by an engineer who looks supercilious at being called out for something so minor, together with the symptoms, on a check-list which selected staff can use to attempt to solve the problem. Such a check-list is illustrated in Figure 10.2. Clear check-lists — the one illustrated may well have faults, but it has served so far — will enable all but those staff who will have nothing to do with computers to work their way through the possibilities; they may also stimulate those who do have an interest in the equipment to think in the right areas, to recognize a symptom not included on the check-list as another possible expression of a particular fault.

Not all occasions when things go wrong are related to hardware; software has its bugs, and these can also strike unexpectedly. Unlike hardware faults, however, it is difficult to learn to cope with these by experience, since once corrected the software should never produce the same fault again. The first problem is recognizing that the fault is in the software and not the hardware. Sometimes this is glaringly obvious — as when an accounts system fails to total, or calculates incorrectly. Sometimes the fault is not in the software, but in the way the library is trying to operate it — this can often happen when setting up parameters to govern a loan regime and trying to work out at precisely which stage of a loan a reservation must be sent to give appropriate notice and yet equally guarantee a minimum length of loan. However, software faults can imitate hardware faults, as when a VDU/Minipen combination refuses to accept data from the keyboard, rather than the light-pen. Again, certain transactions may not be processed, and this might be put down to failure of a VDU to register or transmit, when in fact the software was cancelling or failing to record certain transactions.

It is important, therefore, both to try to explain when problems may or may not result from software, and to ensure that some staff at least know whom to contact, be it
CHECKLIST 1

All or several terminals ‘frozen’

1. If there are NO LIGHTS AT ALL on the minicomputer, go straight to checklist 3.

2. If the numbered lights are not flashing, go straight to step 4 on this checklist.

3. If the lights are flashing, use either the Teletype or the VDU by the printer to go into suspended mode and back to on-line mode.
   If this procedures does not work, or does not ‘unfreeze’ terminals, continue the procedure on this sheet.

4. Check that ENABLE light is ON (top row on panel, 2nd from left).
   If not, switch on with switch at right-hand side of dark grey panel above control panel: switch slides UP.

5. If there is a record sheet attached to this check-list, follow the instructions on it; if not, continue.

6. Go through following sequence:
   STOP                  (to turn light ON)
   RESET
   0200 on 4 x 4 panel   (Light 9 should be only one of numbered lights on; if this is not so repeat this stage).
   WRITE/READ
   P                     (to turn light ON)
   STOP
   RUN                   (to turn light OFF)
   (to turn light ON)

7. Various numbered lights should now come on and start incrementing. VDUs should display SUSPENDED MODE – START OF DAY or ON-LINE SERVICES WILL BE RESUMED AS SOON AS POSSIBLE, which will shortly change to normal menu.

8. If this does NOT happen, continue through checklist 2.

Figure 10.2 Reading University Library check-list for terminal failures
supplier, computer centre or central site of a co-operative, in the event of a software problem. It is important that if possible senior staff who may come across problems and have to deal with them in the absence of the systems librarian should be introduced to the staff of the ‘Help’ service. Psychologically one is more prepared to risk asking silly questions of someone one has met than of a faceless voice at the other end of the telephone; moreover some people, at least, feel more as if they are in control of the situation if they are on first-name terms with the people they are asking for assistance.

One useful feature of software problems is that they are less likely to occur out of normal hours, since (one hopes) staff working in the library on late duties will be sticking to fairly routine operations, and these sorts of problems should only happen the first time something is done. However, many of them only show in the form of problems with output at a later stage. It is vital that all staff dealing with output — be it catalogues, overdue notices, reports on a word processor — note anything strange or at least unexpected. It may point to a system problem; if not, it probably indicates an area in which the system has not been fully understood. In both cases the library needs to consider the implications.

Some hardware faults are susceptible of a software solution — more so than of a hardware solution, in fact. SWALCAP writes data to a local tape and a local printer if the communication with the central site fails. Because all operations tend to be checked at Reading, it was discovered that the tape was only recording 50% of the transactions recorded on the printer. It transpired that the tape was running at double speed, and that the message warning of the imminent end of the tape was related not to the physical tape end but to the number of transactions which had been found to be possible on a normal tape. Because no reason could be found for the speeding of the tape, the solution adopted — ‘temporarily’ — was to modify the programme to accept only half as many transactions before giving the ‘end of tape’ message. The hardware fault remains undiagnosed at the time of writing, every enquiry about it eliciting the response that there is no
speed change on this model of cassette-deck and that therefore the speeding-up process cannot happen.

It does happen, of course, as do other things which I have been told are impossible even as they have taken place before my very eyes. For some of those involved with computers, not seeing is tantamount to doubting. It is at this point that the importance of a single systems librarian who has accumulated a wide variety of knowledge about the installation really shows to advantage. He is trusted by engineers and software suppliers, so that they think twice about telling him he is talking nonsense. Moreover, he can (if he is any good at his job) explain what is happening in terms that a software or hardware engineer can understand. Explaining the problem carefully, ensuring that you are using language in its correct technical sense, often reveals that the basic problem was in fact that library and computer staff had been talking at cross purposes.

It will be seen that the difficulty here is very much the same as that mentioned earlier in connection with the specification of a system; the problem of explaining to a systems designer what the library wants and to the library what the designer is giving them. In fact, where a system has been written specifically for a library this aspect of maintenance is really only a continuation of the design process. In such situations, particularly in relation to microcomputer applications, there is a very real need for someone in the library who understands enough about the system to get it up and running again if it crashes. Obviously it will not have been implemented unless it could carry out most of the major functions for which it was designed, and what sends it into a coma is likely to be something peripheral. Someone has to be able to assess what area of the program is causing problems, take whatever backup copies of the files may be necessary to re-create the problem for analysis later, and get the machine out of its paralyzed state and back working on the routine operations until this problem is solved. Advice on this may be available over the telephone from a supplier, but in the micro-software market the supplier may well be a small firm whose expert on this particular system is engaged elsewhere, and certainly is unable to come out at a moment’s
notice. It is therefore vital that there is someone in the library who can handle the immediate crisis even though he is not qualified to sort out the bug in the software. This means that as staff leave, or move to other departments, time must be found for someone to work him or herself into the system in some detail. It also means ensuring that such a person is on hand whenever a new routine is being performed.

This raises an important point, namely, that library operations must be organized to minimize the disruptive effects of system problems. Libraries are ultimately in the business of serving readers, and where system failures can affect library users directly staff must know both what to do and what is happening, so that they can answer readers' questions sensibly. Naturally for any sort of failure there has to be a procedure — the moving in of replacement equipment, ensuring that the right people are informed. It may be necessary to record transactions on paper, to cease to accept reservations, or to make other adjustments to the normal routine; all this must be carefully explained and laid down in a written procedure.

There may be less straightforward questions to be resolved, such as the relative priority of two services. Machine failure at the central site can leave SWALCAP in the situation where cataloguing continues to function but circulation is inhibited. Recording circulation transactions locally through the minicomputer will, however, prevent the catalogue system from functioning at all. Some guidance has to be given as to the best way of proceeding, and someone has to be given the responsibility for making the decisions; the last thing one wants is an argument on each occasion between the head of circulation services and the chief cataloguer (Figure 10.3).

If staff have some idea of what is wrong, they may feel less completely at the mercy of a machine. Friction, which can quickly become resentment against the equipment, very rapidly becomes evident when a machine is faulty and no one seems to know why. This is true of library staff attitudes to their own equipment — an inexplicable fault on a text-editor causes great frustration and raises doubts about the competence of servicing firms involved — and of readers' attitudes to the system as a whole. Where staff are in direct
1. TRANSACTION INVALID — CPU NOT AVAILABLE
(At Desk)
Keep trying transaction every 30 seconds. If there is a queue, or if it is minimal service, go into OFF-LINE mode. If this is done in normal working hours, liaise with cataloguers to ensure they do not lose records.

NOTE:
Going off-line for CPU unavailable in normal working hours is to be avoided if possible as it disrupts the work of the catalogue typists. The break in service is not normally long, and if readers can be persuaded to come back in half an hour things may be all right. However, if it happens at a really busy time for the Desk, going off-line may be the most sensible solution.

The decision rests ultimately with the Senior in charge of the Desk.

2. TRANSACTION INVALID — CPU NOT AVAILABLE
(for cataloguing transactions)
Keep trying every few minutes — there is no alternative open. Catalogue keyboarders should be found alternative jobs which can be left easily if the system returns to normal.

Figure 10.3 Instructions for coping with interruptions to the service (Reading University Library)

contact with readers, as at an issue desk, there is the added problem of their feeling stupid and inadequate when readers ask what is happening and they do not know. It is therefore a good idea to explain to staff from time to time the sort of problems and faults which may be expected.

The frustration becomes greater when the faults are remote, as in the case of a branch library connected to the main site, or a library using centralized services in a cooperative. The basic types of fault may be recognized, but there is no one on hand to give an estimate of the duration. In the case of the conflict between two services in SWALCAP, mentioned above, the frustration and difficulty are increased by the suspicion that no sooner have arrangements been made to give the circulation service priority than the whole system will be back again. On the other hand, telling readers
to come back in fifteen minutes appears to be a sure way of keeping the service down for two and a half hours. There is no simple answer to this — even if the staff at the central site know, or can guess at, the time needed to effect a repair they do not necessarily have any communication system available to them on the computer, and they probably cannot spare the staff time to telephone fifteen or more libraries to let them know. A library has to make up its mind on the basis of its own experience of the system.

Experience suggests one further point: the need to log the problems one has. There are three purposes to this. The first is to enable senior staff in the library to build up a picture of the behaviour of the system which may enable them to make assessments such as 'it is either sorted out within ten minutes or it takes at least half an hour'. This may enable the drafting of a sensible procedure, to be followed in the case of system failure. It may also enable the anticipation of problems in background operations which follow a break in the service, or breaks which occur with reasonable regularity or in frequently repeated circumstances. The slowing of the system at certain times because of the activities of others (other libraries or other departments) sharing the computer can also be logged to see if it can be anticipated.

The second reason for keeping a log is to be able to quote chapter and verse to suppliers, central sites of co-operatives, or directors of computer centres about the number and types of breakdown and failures. This should not be necessary — they should have their own records — but it can be very valuable when arguing about standards of service. It can also be important in alerting the library to the fact that there is more down-time than it is reasonable to expect. Sometimes, however, it is useful for precisely the opposite reason; unfortunate coincidences of times of breakdown may convince some staff that the system never works, but an accurate record may show this to be untrue, or may make it clear that the breaks in service are very short. It is always valuable to have facts to argue from rather than vague suspicions. This applies too to the repair of equipment under service contracts: it is always as well to keep a record of when equipment was removed for servicing and of any
reports or chasing before its return. There are times when service firms need convincing that they really have had a VDU for six weeks, and that the fault on return was the one it was sent away with.

The third reason for logging faults has a more positive aspect. Sometimes small faults are symptoms of something major which is going to go wrong, and sometimes a whole series of different minor faults is indicative of something wrong. In the first case, even if the minor faults do not alert someone to the impending problem, it will be extremely helpful for someone trying to trace a major fault to be able to see what sort of trouble, relating to what areas of the computer, has been experienced recently. In the second case the systems librarian may be able to do no more than comment on the surprisingly high number of stoppages, misreadings or whatever. If these are clearly documented, however, an engineer or systems support staff may be able to recognize that they are all aspects of a single problem area.

From all this it can be seen that the essence of troubleshooting is documentation and recording; a methodical approach working through various possibilities until a solution is found. This is not to undervalue the inspired guess: often someone who has worked with a system for a fair time gets a ‘feel’ for what is going wrong. This, however, is something which cannot be passed on to successors in the job or even necessarily close colleagues; for them the basic documentation is essential. Thereafter, a systems librarian has to acknowledge that there is little he or she can do to prevent problems, and only a limited amount which can be done locally towards solving them; the job is as much one of helping other staff understand the problems and cope with them as of rolling up shirtsleeves and keeping the system running. In the end a pen, a phone book and a guide to diplomacy are more the symbols of the systems librarian than the screwdriver and the soldering iron, however much acquaintance with the hardware may ease the job.

References
Some of the earlier chapters of this book have been concerned with the interaction between the user and the system, particularly where I have discussed public access to catalogue records or circulation systems. If one expands the concept of 'user' to include library staff also, then perhaps the whole book has been dealing with this question. There are, however, three areas which require further discussion: publicity, feedback and development.

In the chapter on staffing I stressed the importance of keeping all staff informed of what is happening, and letting as many as possible actually try the system out in experimental stages. Both points apply also to readers. Publicity outside the library begins with the attempt to persuade library committees or managing directors of the value of automation in the library. Obviously this will involve the writing of reports and the gathering of financial and management information, but these are just the public versions of the information upon which the internal decision will have been made. It is undoubtedly helpful if some at least of the committee can see the system demonstrated, either locally or in another library. One should be wary of going into too much detail in demonstrations; library committees are library users, not librarians, and they are less inclined to be interested in what the system saves the library staff than in what it gives
the user. The biggest hit of the SWALCAP circulation system, when demonstrated to members of the library committee at Reading University, was the message that a book had been returned at a specific time on the same day; this, more than anything else I could say or demonstrate, showed them the difference between an on-line, real-time system and our previous off-line batch system.

However, once the decision has been made, in whatever area of library routines, users of the library should be informed, and an attempt should be made to explain where it will impinge on them, and what it is anticipated will be its effect in these areas. The reasons for the decision should also be explained, and it is as well to be honest about any drawbacks — such as the splitting of the catalogue, or the inability to continue a number of varied loan regimes. Honest, but positive: it is not dishonest to emphasize, say, that the microfiche catalogue will contain the up-to-date stock which will satisfy a high percentage of readers’ needs. It is important, however, not to overplay the system, or promise what cannot be performed. The last thing which is desirable is for people to feel, when the system is introduced, that it is not working properly because it does not do the things they were led to believe it would. This applies to performance as well as to output: to proclaim that an automated cataloguing system will clear a backlog may be correct, but without a timescale it can lead to a false assumption by readers that all cataloguing will be completely up-to-date within days of the installation of the system.

The dangers of this sort of misunderstanding do not only lie in the dissatisfaction of users and the ensuing credibility gap when the next application for finance is made. Library staff see and hear the publicity, and their morale can be badly affected by the wrong sort of statements. Implications that the whole system will suddenly be up-to-date will result in feelings that they are somehow failing when it still has backlogs, and will make the position of cataloguing staff very difficult when faced with readers irate about the delay to a specific book — a happening not infrequent in academic libraries at least. The problem will be compounded if the explanation of the expected advantages of shared cataloguing
is so phrased that it seems to reduce the whole cataloguing operation to mere routine, while senior qualified staff are still working in the department.

Answering the natural objections, reservations and doubts of readers can also be a minefield. It may be heartening news for readers to hear that a proposed microfiche catalogue is only an interim technology, paving the way for a fully online catalogue in the future. To cataloguers wading through a mass of incorrectly coded data producing a disordered catalogue the implication that it is all a waste of time can only be depressing. Again the omission of any realistic timescale in such comments can lead to an aggravating succession of questions from readers on the lines of 'when do we get our proper catalogue?'

Some of these problems apply more to academic than to public libraries; academic libraries have smaller, better-defined populations of users with whom the contact is closer and who are more likely to press for details and forecasts. Some of this may be true of special libraries also, although in many cases the much smaller library staff means that there is less chance of complete separation of the spokesperson from the labourers in the vineyard. In public libraries, the problems are more likely to arise from an assumption on the part of many readers first, that the whole exercise is motivated by desire for empire building or an easier life on the part of the library staff (untrue) and second, that whatever they think will have little influence (probably true). The task of publicity in this area will therefore be to overcome initial suspicion and to arouse interest rather than damp-down interference.

Apart from the initial explanation of what is to be done, it is important that progress reports are available outside as well as inside the library. This is especially so when — as in the case of a new circulation system — the lead-in time may be considerable and may involve some disruption to users (as for example the labelling of the bookstock). Explanations of how a particular operation fits into the whole implementation and statements of how much of the initial preparation has been completed, are always helpful; in public libraries the latter, particularly if displayed in graphic form, may help in the general creation of interested awareness. The use of
photographs is important too, especially in situations where a large number of users are unfamiliar with the sort of equipment mentioned in the publicity.

With users as with staff, it is important that they get to see the system in action as soon as possible. In an academic library, with its limited user community, this may be possible — academic staff, at least, can be brought into the library, shown the system, and allowed to ‘play’ with it. A good deal of such introduction was done at the Polytechnic of the South Bank. Students may be more difficult to cope with, although if the introduction of the system takes place at or near the commencement of a session it can be mentioned and perhaps demonstrated in introductory talks and tours. The whole problem is much greater for public libraries, but where their readers are to be required to make use of new equipment this can be put out, with full written instructions, as soon as possible; staff must also be prepared to assist readers and explain the whole system during the first few months of operation.

Where the system is primarily housekeeping, as in the case of a circulation system, the need for first hand experience by users is naturally reduced. However, it is helpful if they can see tangible progress — the issue of new-style reader cards, and perhaps the use of the system for selected categories of stock. In this way they will feel that something is really happening, and will have something to relate to the other forms of publicity which are around. Even in the case of a circulation system it does no harm to set up a terminal for readers to read in the bar-code on their reader card, either to get a display of their registration record (this may ease some fears of the ‘Big Brother’ aspects) or just to have the number displayed on a screen. As well as allowing them to use the equipment and thus ultimately appreciate the problems which may face library staff, it may also reassure them about the accuracy of the reading equipment.

One other aspect has to be catered for, the bad publicity of ‘down time’. As with other possible drawbacks, the possibility of this should be mentioned before the system is operational, together with the arrangements which will be made for the maintenance of the service should it occur. If,
as is not infrequent on installation, the system gets off to a shaky start with more down time than is reasonable, it is probably better to make a clean breast of the problem: explain (insofar as one can) what is the cause, what steps are being taken to cure it, and what the actual times of failure were. This last has the double benefit of squashing some of the wild rumours that fly around (among library staff as well as users) of whole days when the system failed to work, and also of allowing the improvement to show when the problem is finally cured.

The other form of bad publicity which must be avoided is the inaccurate notice, particularly overdue notices. Everyone has a story about incorrect bills or bank statements or something which is blamed on ‘the computer’. We shall know when artificial intelligence has really been produced when a computer sues for defamation: computers only do what they are told to do, and the faults ultimately rest with human beings. It is as well to experiment with such things as the parameters relating to overdues and recalls before letting the results loose on the public. Above all, staff must be warned not to blame the computer for mistakes, since once a suspicion of unreliability has been implanted in the minds of users they will be disinclined to believe any information they are subsequently given. This can lead to endless arguments of the ‘I have’; ‘You haven’t’ variety over the return of books.

Far better, therefore, when things have gone wrong, to investigate the cause and explain it to the readers concerned; or at least make it clear that the fault is known, is (probably) a human error, and is not likely to be repeated. There are machine errors possible, particularly if the failure of a computer causes confusion in its memory as to date, or occurs over the period when a batch of weekly overdues is to be run. These sorts of instances tend to be rare, and are usually compounded by an operator’s error in failing to re-run a missed job. It can, however, usually be shown that whatever the failure of output the actual records in the computer are accurate. It is worth taking the time to do this in the early stages to prevent the growth of general suspicion.

It is extremely important that the introduction of computers into the book circulation operation should not be
allowed to depersonalize the relationship between library staff and readers. This becomes a danger when the staff involved have only a slight idea of how the system works, and can do little more than say ‘The computer says so’, or (when the machine is down) ‘It’s not working’. Equally disastrous is the introduction of too rigid a framework of regulations, so that there is no one who knows how to use the system flexibly to cope with the genuine exceptions. Staff with their eyes glued to VDUs so that they never look at the readers cause my blood pressure to rise; so do systems which cannot treat me as a person but can only access my records through a borrower number. These are all areas to be taken careful note of in choice of system and especially in the training of staff.

Once the system is installed and commissioned, it is important not to walk away and leave it. Reactions to it have to be gathered, analysed, and if necessary acted upon. Gathering library staff reactions is fairly simple; it is important to listen to the comments of all staff, and not to confine the right to evaluate to those who use it heavily or those in senior positions who only organize its use by others. The reaction of a member of library staff not wholly familiar with the system — a new member of staff, or one from a branch library or another department — may give some indications of the reaction of the untrained reader. Informal reactions can be gathered by anyone standing near the equipment with eyes and ears open; some system needs to be set up to make more formal comments which may be the subject of later changes. Where a group or groups have been established to assist in the design and implementation, as suggested by Norman Turner, these may continue to meet after installation to review operation. The librarian must ensure that any such group remains fully representative of those affected by the system, and is therefore widened to include representatives of areas of operation not originally thought to be involved — most systems spread their tentacles wider than at first envisaged.

I myself favour a formal grouping of section heads directly affected, and a number of smaller, *ad hoc* problem-solving groups. If a decision is required, then a group of between
three and six is optimum; if the formal decision is to be taken by a larger body then this body needs a concrete proposal to discuss. The sort of situation I envisage is that a systems working group would need to involve the heads of circulation, cataloguing, acquisitions, periodicals, perhaps inter-library loans, and reference services; possibly the head of binding control also. Such a group will be needed particularly where the system either is integrated or is being developed in that direction. This, however, is not at all the ideal group to discuss a problem with the reservations system, or the delay in passing books from descriptive to subject cataloguing, or the deficiencies of the public access vocabulary on the periodicals system. For such discussions a group involving more members of the section most concerned needs to be established.

All staff must be able to feed their reactions into the discussion somehow, to mention the areas that cause problems either for themselves or for readers. How this is done will depend very much on the staffing structure of the individual library; it may be necessary to have a ‘comments’ book, or contact between staff at different levels may be sufficiently established for verbal comments to be relayed to the appropriate area. All comments should be considered and answered — nothing will lower staff morale so much as the feeling that opinions are disregarded. There may be good reasons why apparently sensible suggestions cannot be followed up; if so, these reasons should be made public. If this is not done, staff may be forgiven for assuming that the reasons are not sufficient.

The relaying of readers’ comments is vital. Very often it is only the inveterate complainers who will take their grouse to a senior member of staff; the mild and inoffensive will sometimes be provoked to mutter comments to the assistant who stamps their books, or who is shelving near them. In an academic library students may be employed to shelve or help out in evenings or at weekends; such staff provide a bridge between readers and the library which should be used anyway as a method of communication, but which can fulfil an especially useful role at the introduction of a new system. Any other means of assessing and discovering readers’
reactions to the new system which seem practicable should be used. Unfortunately most of the standard methods have drawbacks. Comments books can lead to all sorts of useless comment, from the obscene to the vituperative. Questionnaires go largely unanswered. Surveys in which people are observed using the library, and perhaps questioned afterwards, are very staff-intensive and thus costly. The observation part may be helpful (if staff can be close enough to observe without obtruding); but people are wary of admitting failure to discover what they were looking for, or to carry out the instructions given, so that the questioning can be misleading unless carried out in a very carefully designed pattern. A lot will depend on what is actually being studied. In some areas the system may be able to supply its own information; I have earlier mentioned the use of transaction logging to study the sort of enquiries readers make when offered a choice of author, title, keyword or classmark; equally the system will be able to monitor a change in the number of loan transactions which may indicate reader satisfaction or dissatisfaction. Uninterpreted statistical data are, however, extremely dangerous. At Reading University Library we recently introduced public terminals with access to the circulation system back-up record. This access is by item number (access to a specific copy only), class number (twenty records at a time, each record representing all copies of that title, displayable by a second step), and description — for which it is necessary to know if the book has been entered under author or title (in other respects this is similar to classmark enquiry, except that only ten records are displayed at a time). Statistics and observation both indicate that these terminals are heavily used by readers; equally the statistics show that search by description is the most popular transaction. What the statistics cannot show, however, is why this is so heavily used: is it just because more enquiries are made, or is it because people are entering inefficient or totally incorrect search keys, and then paging through screen after screen in the hope of finding what they are looking for? Do people use it because the signs mislead them into thinking that this is the basic catalogue of the library, or do they genuinely find it a quick method to check before exploring further in the more
conventional catalogues? Equally the statistics cannot tell us the degree of success with which any search is attended; several hundred searchers a week could be leaving the terminals disappointed. We are thus left with a service which is costing a lot of money, which is of questionable benefit, but for which the only evidence we have is that it is too heavily used to be dropped.

Computer systems can supply all sorts of statistics — how many children's books in non-fiction classes were issued in a particular library between 3 and 4 pm on Thursdays in October to readers with adult tickets; how many books ordered because they were on lecturers' reading lists never left the library in the last academic year. If a systems librarian wanted to, he could probably fill his office with print-outs of statistics, the only limits being the cost of producing them and the need to let the system operate normally from time to time in order to have some statistics to produce. It is usually impossible to predict, when setting up a system, what statistical information is likely to be required. For this reason, statistical programs have to be set up to be as flexible as possible — hence, for example, the need to be able to break down circulation figures by time, by type of book, and by type of reader. The SWALCAP cataloguing system allows records to be selected by any element in any field, including the setting of bits in control words, and the resulting selection to be counted.

Once again, however, the basic philosophy has to be that just because it is possible it need not be desirable, at least on a regular basis. In general, no statistic should be requested unless a decision will be taken as a result of it. There are occasions when this does not apply — when, for example, one wishes to find out what sort of users borrow a specific group of books; if the resulting group of borrowers appears to have no common element one may not wish to take the matter any further. Perhaps therefore one could widen the basic rule to say that statistics should only be gathered if it is felt that something can be learned from them about the operation of the library, and that certain answers would lead to decisions about that operation.

For it must be remembered that 'development' is not
confined to development of the computerized systems; development must encompass also the development of the whole operation of a library as affected by the systems introduced. One of the benefits of introducing automation should be the greater amount of information about the workings of the library. My first example of statistical information was obviously ludicrous, and although statistics of the use of a branch library at particular times of day may assist in proper deployment of staff and even in the proper assessment of opening times, such statistics can be kept manually with relative ease. In other areas, however, computers can relate disparate information to produce something meaningful. To take an extreme (but genuine) example: a title in a short loan collection with forty date-stamps for a single term would be very high on anyone’s list for purchasing extra copies; however, the computer can indicate that all those loans were for the same person, and thus a single copy is sufficient to cope with demand. (Equally, that copy probably needs transferring from short to normal loan status.)

At Sussex University Library information on which titles have been borrowed and which have not in particular subject areas is fed back to the subject librarians to see if they can discern any common pattern — either in terms of subject content (Byron in, Shelley out) or of level or style of book. This in turn influences future buying policy, suggesting which areas should be fairly fully covered and which should be stocked with only the really outstanding books to ensure that the library has a nucleus on the subject. As cuts in library budgets, in all sectors of librarianship, bite deeper it is going to become more and more important to understand the patterns of use of material, and the patterns of borrower behaviour. What is the optimum period for the loan of a short loan collection book in an academic library? It must be short enough to ensure that it is kept in circulation, but long enough to allow the borrower to read it. This suggests that it will vary from subject to subject and even from book to book; some experimentation with different periods may serve to establish optima for particular subject areas at least. From its records of how long a book spent on loan or not on loan, a computer can calculate the odds on a reader finding a copy
of a book on the shelf; further copies may then be purchased to bring those odds to an acceptable level.

Logging of keyword searches or subject searches made on an on-line catalogue may assist cataloguers in providing the necessary cross-references between terms — particularly in areas where terminology changes. Unsuccessful searches, or searches providing less than a set number of matches, could be highlighted in the log to see whether they are areas in which the library holds sufficient material, but not accessible under this particular term — a case for a reference; whether the term is completely erroneous; or whether the library’s stock in the area is low. If the latter is the case, the number of enquiries by subject may indicate whether the area is of general interest to a number of library users or of interest to a more limited group — at least until such time as a single reader realizes that if he inputs his enquiry four times a day from different terminals he can rig the system.

Statistics are also of importance when experimental changes in operations are introduced. What happens to short loans when the loan period is altered? If readers are allowed to make their own reservations, is there an increase not only in the number of reservations made but also in the number of reserved books left uncollected? For however much one may sit around and speculate as to the likely effect of a change, in the end there comes a stage at which a pragmatic test must be made. The essential feature which must not be lost sight of is that if the change does not work it should be scrapped. This applies to both overall operation of the library and to changes in the software of the computer system. This is not to say that changes should be introduced lightly and scrapped before people have grown accustomed to them — no change should be introduced without considerable preliminary thought and study of such data as there are relevant to it. Nor should it be abandoned until there has been time to see how it works, and for users to become aware of its possibilities. Nevertheless, if libraries are to offer their users the services they require, they have to become far more dynamic and responsive than has often been the case hitherto.

Development of any aspect will not be straightforward, but development of the software in particular will be subject
to certain limitations. The prime among these will still be finance: any change has to be paid for one way or another. Because of this it is important not to rush at the first alteration which is suggested, only to find either that a more important modification suggested some weeks later cannot now be afforded or that such a modification renders the original alteration irrelevant. Better to have regular meetings of a development group involving representatives of all sections involved, at which priorities can be argued and decided upon. Academic libraries may be able to involve users in this process through faculty library committees and user committees; in a public library usually only the library committee can perform this function.

There will, of course, usually be other limiting factors. Even in a home-grown system with systems staff employed by the library the necessary expertise in a particular area may be lacking; consequently the lead-in time for development will be greater, and may therefore cause more manageable work to be given a higher priority. If the programming expertise is coming from outside the library, other calls on the programmers' time may limit what can be done. In the context of a co-operative, some general consensus must be reached among members on basic priorities for development, although again certain features may reach the top of the queue merely by being finite and reasonably straightforward.

Into any such consideration of developments must be fed information from outside. Whether or not a library is a member of a co-operative, it is not an island. Visits to other libraries (and from them), seminars, published accounts of practice and research must all be used to stimulate thinking about the direction the library should be going. The realization that something thought desirable but impracticable has been implemented somewhere else will stimulate thought on its achievement locally. Nevertheless, development is not achieved merely by copying what has been done elsewhere; often a local development is tangential to something which has been reported, introduced because the report sparked off a line of thought in someone's mind.

The one certainty in all this is that development will have to take place. Any system which stands still tends to lose
credibility with both users and staff. This may or may not be a good thing; perhaps we should be better if the pace of change were slower. However, technology is advancing very rapidly at the moment, and the knowledge that systems are available which can do more than one’s own current system normally acts as a spur to develop one jump ahead. As Peter Gratton has said:

Once consideration of computers starts, and more particularly once a system is implemented, there is really no turning back. The first system is no more than that, for a first suggests a second, which suggests a third, and so on. To some this looks like infection, to others inspiration, to most of us something in between the two but impossible to shake off! 5

Once a development has been implemented, of course, the whole cycle begins again: publicity, evaluation, suggestions for further development. At times the process can feel like a treadmill, at other times it seems to have a momentum of its own so that library staff are running to keep up with it. It is important that automation never gets out of control. It would be easy at times to run the library for the automated systems, but it should always be remembered that in the end they are the tail — service to readers is the dog which must do the wagging. All development, like all statistics, should be assessed not on the criterion ‘What can I do with my system?’ but ‘What can my system do for my library?’ At this point we have come full circle, for this is the basic question with which I began the discussion of the value of any computerization. The intervening chapters have, I hope, served to highlight some of the considerations which must go into providing the answer.

References


Bibliography

Any bibliography of this subject is liable to be out-of-date before it reaches publication. As well as the references given below, anyone working in this field is recommended to consult the latest numbers (as well as back issues) of:

- ASLIB information
- Current awareness bulletin (ASLIB)
- Library and information science abstracts (LISA)
- Program
- Vine

The application of inexpensive minicomputers to information work, AGARD, 1978 (AGARD Lecture Series LS92).

Ashford, J H, 'Cost effectiveness in library automation' in The application of inexpensive minicomputers to information work, (qv).

Ashford, John H, 'Storage and retrieval of bibliographic records: a comparison of database management systems (DBMS) and free text approaches', Program 18(1) Jan 1984, 16-45.


Birkenhead, Tom and Allen, David, 'Common pitfalls in data processing:
mainframe lessons for micro users', ACCESS: Microcomputers in libraries 2(1) Jan 82, 3-4, 28.
Burton, Paul, Microcomputer applications in academic libraries (British Library Research and Development report 16).
'Cataloguing in publication: what is happening?' Catalogue and index 63/64, Winter 81/Spring 82, 1-16.
Chan, Graham, 'Keyword catalogues at Liverpool Polytechnic Library', Catalogue and index no 69, Summer 1983, 5-8.
Conference on new approaches to document delivery: systems, services and their implications, reported in ASLIB proceedings 35(4) April 1983.

'Electronic mail — what's it all about?' What to buy for business, 9 March 1983.


'Appraising software packages', Electronic library 1(3) July 1983, 162-3.


Grosch, A N, 'Commercial database management system (DBMS) software in larger minicomputer systems', in The application of inexpensive minicomputers to library work (qv).


Leeves, Juliet, 'Survey of automated issue systems in public libraries', Vine 52 (December 1983).


Lovecy, Ian, 'What's in cooperatives for me?', Catalogue and index no 61, Summer 1981, 1-6.


*Proceedings of the 1973 Clinic on Library Applications of Data Processing: Networks and other forms of co-operation*, London, 1974. (The whole series of clinics is worth consultation.)


Rosaschi, Jim, 'How to avoid worthless micro-related purchases', *ACCESS: microcomputers in libraries*, 2(1) Jan 1982, 6, 26-27.

Seal, Alan, Bryant, Philip and Hall, Carolyn, *Full and short-entry catalogues: library needs and uses*, Bath, 1982 (British Library Research and Development reports 5669).


Watson, Margaret, Moore, Rosemary and Jordan, Sally (eds), *Independent versus cooperative cataloguing systems*: proceedings of a seminar held at the School of Librarianship and Information Studies Newcastle upon Tyne Polytechnic on September 22nd 1982, Newcastle upon Tyne, LA UC & R, 1983.


These definitions are in most cases based on the glossary in *Vine* © British Library Board 1984. Reproduced with permission from the British Library. The definitions are as the terms are used in the text — in some cases there are alternative, or wider usages.

**Bar-coded label**  
Label containing alphanumeric or numeric data encoded into a series of thick and thin vertical bars. These are 'read' by a fibre optic light-pen. Used in circulation or stock control.

**Batch**  
A method of processing data in which transactions are collected together and input to the computer in a single bloc. Batch processing always involves some delay between the occurrence of an event and the processing of the transaction recording it.

**Bit**  
A binary digit (conventionally 0 or 1, true or false, + or −, or any other two-way switch).

**Boolean logic**  
As used in information retrieval, Boolean logic is the use of the words ‘and’, ‘or’, ‘not’ to link separate concepts in order to arrive at a precise statement of the subject required and one which the computer can understand.
Byte
An eight-bit representation of a character.

Check digit
A digit arithmetically related to the rest of a data field which can be used to check the accuracy of the data.

CIP
Cataloguing-in-Publication. The provision of a basic catalogue record from publishers' advance information; this record is printed behind the title page to assist cataloguers. CIP records are also available in BNB and on MARC tapes.

COM
Computer output microform. Microfilm or microfiche produced from a machine-readable tape.

Co-operative
In this context, a consortium of libraries who join together to provide automated systems sharing a common development team and (often) common computer facilities.

Core memory
The part of the computer in which the actual processing is done: its size regulates the amount of work which can be done at once, and therefore the speed of operation of the computer. Core is usually measured in 'K' — thousand byte units; as core is manufactured in binary blocks, 1K usually means 1024 bytes.

CPU
Central Processing Unit — the area of a computer which controls and co-ordinates the activities of the other units of the system and performs all the arithmetical and logical processes to be applied to the data.

Database
A collection of records; a file of (machine-readable) information. (This is the sense generally used by librarians — the term is often used differently by systems analysts).

Database Management System (DBMS)
A general-purpose facility for setting up and managing a structured database, without the need to write a specialized code each time.

Data capture unit
A terminal which enables data to be input quicker and more correctly than by normal keyboarding. The data are frequently coded (bar-code, OCR font) to enable a quick and easy read.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>Dial-up line</td>
<td>A connection between a terminal and a computer, or two computers, which is established by dialing via the telephone network.</td>
</tr>
<tr>
<td>Disc/Disk</td>
<td>A data storage device consisting of one or more flat circular plates coated on both sides with magnetizable material and mounted on a central spindle. Data is stored in tracks — a cross between an LP record and sound-recording tape.</td>
</tr>
<tr>
<td>Diskette</td>
<td>A data storage medium similar to disk but cheaper and usually of small capacity. Usually known (from their flexibility) as 'floppy-disks'.</td>
</tr>
<tr>
<td>Electronic typewriters</td>
<td>Typewriters with some degree of memory, the ability to carry out editing operations before printing, and an ability to reproduce a document any number of times with or without modifications. They normally have limited display facilities, not a full VDU screen.</td>
</tr>
<tr>
<td>EMMA</td>
<td>Extra-MARC material. Records in MARC format created by libraries other than national libraries.</td>
</tr>
<tr>
<td>Field</td>
<td>A discrete sub-division of a machine-readable record identified by a tag or indicator.</td>
</tr>
<tr>
<td>Fixed-field</td>
<td>Method of structuring a record where each part of that record is assigned a set number of characters. It is inflexible but easy to handle.</td>
</tr>
<tr>
<td>Free-text</td>
<td>Normally in the phrase 'free-text systems' — systems which store natural language computer records just as in the original, and allow the searcher to search for any word in the text; as opposed to 'indexed' systems, which restrict access to certain terms in certain fields.</td>
</tr>
<tr>
<td>Front-end processor</td>
<td>A minicomputer or similar which organizes work being input onto a large mainframe in order to increase the mainframe's efficiency. The front end may also be used for actual processing of the data.</td>
</tr>
</tbody>
</table>
Handshake  A jargon term for a piece of circuitry which connects two systems or parts of a system. It is particularly used where incompatibility of two pieces of equipment requires some processing between them (cf Interface).

Hard line  A telecommunications line between two computers which is permanently connected, as opposed to needing the connection to be dialled. (See also Leased line.)

Hardware  The physical/electronic units making up a system.

Hit rate  The proportion of enquiries which are successfully matched with the relevant records in a database.

Intelligent terminal  A terminal incorporating a microprocessor and capable of performing simple processing tasks independently of the larger computer to which it is connected. (The borderline between 'intelligent terminal' and 'microcomputer' is becoming increasingly blurred.)

Interface  A connection/junction between two systems or two parts of the same system.

Leased line  A line provided (normally) by British Telecom connecting two pieces of equipment, not part of the general telephone network, for which the subscriber pays a fixed rental irrespective of the amount of use made of the line.

Line speed  The amount of data which the line can transmit in a given time without the risk of corruption of the data. Usually measured in bits per second (bps).

Mainframe  A large computer, normally requiring a number of operators and special provision such as air-conditioning. (The most recent technology is reducing the need for these attentions, and the term is coming to be used colloquially of the largest computer in a multi-processor system.)

MARC  MAchine Readable Cataloguing – a tagging scheme for bibliographic databases – used
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<td><strong>MARC (continued)</strong></td>
<td>(with some differences) in the production of UK and US national bibliographies in machine-readable form.</td>
</tr>
<tr>
<td><strong>Microcomputer</strong></td>
<td>A small computer, based on one or more microprocessors, offering a low-cost, small storage, moderate performance unit in a compact size. (As microprocessors become more powerful, and storage more compact, the difference between a microcomputer and a mainframe will diminish.)</td>
</tr>
<tr>
<td><strong>Microprocessor</strong></td>
<td>A programmable logic device, usually contained within a single physical 'chip' of electronic elements.</td>
</tr>
<tr>
<td><strong>Minicomputer</strong></td>
<td>A small computer capable of independent processing and handling a number of simultaneous on-line users, and not requiring special operating conditions. The definition has blurred at one end of the spectrum with microcomputers, and at the other end with modern mainframe computers.</td>
</tr>
<tr>
<td><strong>Modem</strong></td>
<td>Modulator-demodulator: a device that codes and decodes digital signals so that they can be sent via a telecommunications link.</td>
</tr>
<tr>
<td><strong>OCR</strong></td>
<td>Optical Character Recognition: a range of devices that will 'read' and interpret printed digits or characters and convert them into a form usable by computers in internal processing. They have a wide range of speed, cost, and tolerance of deviation from a standard typeface, and can now exceptionally cope with handwriting. They are being used increasingly for the conversion of large quantities of text (published catalogues and even literary works) into machine-readable form, rather than just for data-capture.</td>
</tr>
<tr>
<td><strong>On-line</strong></td>
<td>Direct access from a terminal to a computer’s CPU, enabling virtually immediate processing of input.</td>
</tr>
<tr>
<td><strong>OPAC</strong></td>
<td>On-line Public Access Catalogue — a system in which a user consults the machine-readable version of the library catalogue direct from a computer terminal.</td>
</tr>
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</table>
Package
A set of generalized programs written, frequently commercially, for a number of users with broadly similar requirements.

Parameter
A definition by the user of the particular values or limits or paths for certain processes within a range of choice offered within a system.

Real time
A system in which the processing of data occurs virtually simultaneously with the event generating that data.

Software
Operating instructions for a computer.

Stand alone
A system which is complete in itself, as opposed to one which relies on data or processing supplied by another computer.

Turnkey system
A computer system where the hardware and software are supplied as a unit, and where it can (in principle) be switched on and used with about the same level of preparation and expertise required by an automatic washing machine.

UKLDS
United Kingdom Library Database System—a proposed system for a national database of machine-readable catalogue records based on the UK MARC files but incorporating records created by libraries other than the British Library.

Validation
Checking a set of data (e.g. ISBN) on input to a system to make sure it is correct. This may include not only the use of a check digit, but also checking of layout, punctuation, and combinations of data elements.

Variable field
A method of structuring a record whereby all or some parts of that record may vary in length. Useful for dealing with non-uniform records, as in cataloguing; it can present complex handling problems.

VDU
Visual Display Unit: a TV-type screen on which data is displayed, normally combined with a terminal keyboard. (Otherwise VDT.)
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