Universal Availability of Publications in an Electronic Age

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1. Introduction

It no longer needs to be said that no library is self-sufficient, and that dependence on other sources of documents is inescapable. Since World War 2, interlibrary document supply has increased by leaps and bounds. No precise figures exist, but it has probably grown by a factor of four or more in most countries since 1950. The reasons for this growth are obvious enough. Even if library budgets have kept pace with inflation — and in many countries they have not — this increase has not been nearly enough to keep pace with the growth and cost of publications. In Britain, some university libraries obtain 18 000 or 19 000 items from elsewhere each year, and some big industrial libraries approach this figure.

2. Recording of library holdings and access to them

Generally speaking, document supply has lagged far behind bibliographic control. The period since World War 2 has seen the creation of many new national bibliographies and an extended coverage and improved frequency of others. The large databases in science, and indeed in other fields, have also improved their coverage. While bibliographic control is by no means comprehensive — ‘grey’ literature in particular is poorly controlled, as are the journals of less-developed countries — it is possible to identify fairly easily most significant material that has been published in most countries. Much of this improvement would not have been possible without automation; the ability to manipulate bibliographic records by computer has enabled bibliographic tools to be produced more frequently, to be cumulated and updated as required, and to be indexed in a variety of ways that were almost inconceivable when indexes were constructed manually.

By contrast, document supply is still very largely a manual operation. Many union lists are still in card form, or are printed from entries on cards. Most requests are sent in by mail. When they are received they are matched with items on the shelves, and the items are sent through the mail, either as loans of original copies or, in the case of many journal articles, as photocopies. Loans also have to be returned by mail. Special transport systems may be used instead of mail, or to supplement it, but the systems are still manual ones.
Automation has certainly made significant improvements possible over the last decade or so. Increasingly, union catalogues are held on the computer. This has several obvious advantages. Catalogue records can be transmitted online, by contributing libraries, to the union catalogue centre; this speeds up entry into the union catalogue, and entries are less likely to be omitted or forgotten (as frequently occurred with manual systems), but delay can still be caused by slow processing in contributing libraries, which may take anything from a month to a year, or even more, to catalogue books after their arrival.

It should also be possible to search union catalogues directly online, thus cutting down the time of searching for locations; and also to send requests direct to holding libraries, thus reducing request transmission time. There should also be a facility built into the system for switching requests automatically from libraries that cannot supply requested items to other holding libraries; and for sending replies online to requesting libraries in cases of inability to supply, of delay because an item is already on loan, or of uncertainty about the precise identity of an item. The OCLC ILL Sub-system has all of these features.

Union catalogues, and catalogues of major libraries, are being automated all over the world. Direct access to the holdings of libraries in other countries is adding an extra dimension to interlibrary access. International interlibrary requests have already grown considerably faster than within countries; they may now number between 1.5 and 2 million a year (the British Library alone receives nearly 800,000 a year). Many countries, including the UK, use the OCLC ILL Sub-system extensively to locate and request books and other materials. One would expect most major West European countries to have their union catalogues accessible in a similar way within a few years.

There will also be improvements in requesting. Document requesting protocols are already being developed. It is of great importance that one single protocol becomes the standard that is accepted and used all over the world; a number of different protocols can only be wasteful, confusing, and ultimately damaging to the purposes they are intended to serve.

These developments will greatly aid availability, and incidentally influence national acquisition policies. There is much less need to try to ensure extensive collections of foreign materials within a country if little-used materials can be readily obtained from abroad. Moreover, they will make co-operation for document supply between countries in the same region of the world largely unnecessary. If requests are transmitted electronically, distance is of almost no importance, although the time difference may cause a day's delay because requests transmitted during the day may arrive in the evening or night and so may not be attended to until the following day. Documents sent by air mail take little, if any, longer to travel halfway round the world than between two adjacent countries; the postal systems of the countries affect supply time much more.

The main deciding factors in the choice of a document supply source should be cost, speed of supply, and probability that the request will be met; and distant countries may perform better on these criteria than nearby ones. In many regions of the world the probability of satisfaction is low and the speed of
supply is poor; and efforts would be better directed towards improving world-
wide electronic links than to encouraging regional schemes. At the same time,
it must be added, efforts must also be directed to improving national resources
in less-developed countries. International access, whether world-wide or
regional, will always be a supplement to national access, not an alternative; it
is more costly, generally slower, and dependent on some degree of political
stability.

However, in most countries the main delays in interlibrary access occur not
in transmission of requests or material but in requesting and supplying
libraries. The only effect automated systems have on these delays is a
psychological one: libraries may feel under some pressure to deal quickly with
requests in a system that is otherwise very fast, particularly since they know
that blame can no longer be placed on delays in the postal system. It has, in-
cidentally, always been a mystery to me that many libraries take so long to deal
with interlibrary requests, which they do not generally receive in any quantity
and which do not involve a great deal of work.

3. Transmission of documents

Automated union catalogues cannot do anything to speed up the transmission
of material, whether loans or photocopies. A clear distinction needs to be
made here between ‘copiable’ items such as most journal articles, and ‘non-
copiable’ items such as books (unless only a few pages are wanted from a par-
ticular book); quite apart from considerations of copyright, there is no real
alternative to lending the book itself. Typically, over half of all requests are
for journals, but that still leaves a very large quantity of book requests. In the
UK, for example, over one million books are requested each year on in-
terlibrary loan. Over long distances, surface mail is unacceptable; it takes too
long. In consequence the book is away from the supplying library for a long
period, a fact that may inhibit libraries from supplying many books at all. Air
mail is fast but expensive. It is difficult to see how any advances in technology
can affect the speed of transmission of books. This means, incidentally, that
countries should aim at a higher level of national self-sufficiency for books
than for journals.

Telefacsimile, which dates back well over 100 years, has been used for some
years for the transmission of journal articles. However, while it is excellent in
cases of urgency, it is still much too slow and costly for regular use. CCITT
Group 3 machines can take anything between 10 and 30 minutes to transmit a
10-page article. It is also of course necessary to log-on to the receiving library.
In addition, the machines will accept only sheets of paper, not original books
or journals, so that xerographic copies have to be made first. It is easy to see
how transmission of an article can easily take half-an-hour or more. Moreover,
since the equipment is expensive, it needs to be fairly intensively used to justify
its cost. It should therefore be used to transmit twenty articles a day if pos-
sible; it would be difficult to do more because of the slowness of transmission.
It is thus unsuitable for very small quantities, and equally unsuitable for large
ones, unless a whole battery of machines is to be installed.
CCITT Group 4 machines promise considerable improvements. They are much faster than Group 3 machines, and they produce much better copies. They cost nearly ten times as much, but the unit cost of transmission is much lower, so that they could well compete with conventional copying and mail systems. However, they require digital rather than the normal analogue telecommunication links; this means that libraries either have to wait for Integrated Services Digital Network (ISDN) to become more widespread or to have dedicated lines installed. Even when this happens, many more libraries need to have these machines before they can be used extensively.

Telefacsimile seems at present to offer better prospects than satellite transmission, of which much was hoped a few years ago. However, things can change; in a few years’ time, much current thinking will probably be obsolete, so rapid are developments in technology.

4. Electronic storage and transmission

The only real hope of further improvement in the supply of text is in its electronic storage. If actual text is held on magnetic tape or disk, or CD-ROM, it opens up the possibility of direct transmission. This is, on the face of it, a very attractive proposition. How realistic is it?

Very little text at the present is held in electronic form. Admittedly, much of it goes through such a form on its way to computer typesetting, but these texts are unsuitable for retrieval or transmission, because they use character, rather than digital, encoding and are full of computer typesetting instructions. It is possible to convert them to an appropriate form, by use of SGML (Standard Generalized Mark-up Language), but use of this is by no means universal, and it is costly. Where text is in a form suitable for retrieval and transmission, it has either been re-keyboarded, as in the case of the legal database LEXIS, or digitized from the printed text, as in the ADONIS project. Either method introduces an additional delay after original publication.

Forecasts were made over ten years ago by Lancaster that electronic journals would be more economic than conventional printed journals by the early or mid-1980s. This prediction has not of course come true, nor are there any immediate signs that it will be true in another ten years from now.

Some journals are held on magnetic tape or disk and can be accessed online. Most of these, but not all, are also available as ordinary printed journals. They are not numerous, and their number has not increased much over the last four or five years. No figures are to my knowledge available for online usage of these journals; this leads one to suspect that usage is small, certainly not at such a level as to constitute a viable alternative to printed journals, and probably not at a level that covers the costs of the system.

The most significant project in the electronic storage of text is the ADONIS project. This is by now well known. Two hundred and nineteen journals, mostly biomedical and mostly high-use, are digitized from printed issues and stored on CD-ROMs (this number of journals was determined by the capacity of a year’s disks). The disks are issued to various centres throughout the world, where they are used in various ways, in-house or for remote supply.
The British Library Document Supply Centre, which has co-operated in the project in its various forms from its earliest days, has copies of these CD-ROMs, which arrive slightly less frequently than once a week. Each disk contains current issues from a variety of journals; no attempt is made to break them up into subsets by subject, by language, or in any other way. At present, when requests are received at the British Library, the disks are scanned and the articles are printed out. They are then sent in the mail as now, or, in cases of urgency, sent by telefacsimile. For the requesting library there is thus no improvement at all over the supply of photocopies of printed journals except that they are of higher quality, particularly where illustrations are concerned. Biomedical journals were chosen for the project because illustrations are so important in many articles, and any system that could not produce copies comparable with the originals would not be satisfactory. This is also one reason why digital encoding is used rather than character encoding, which is, of course, quite satisfactory for straight text. One disadvantage of digital, compared with character, encoding is that machine searching of the text itself is not possible.

This is obviously an imperfect and incomplete system, and one of the next stages involves the electronic transmission of the material, without going through a process of printing.

The ADONIS project was an experiment, and its future directions are not yet clear. The potential implications are profound, but in the last resort everything will depend on economics. Admittedly, there are still some technological barriers to be overcome, but there seems little doubt that they will be.

5. CD-ROMS as vehicles for journal text*

Eventually, CD-ROMS could store vast quantities of literature in a compact and accessible form, which could be sold to many libraries. They would then be able to achieve a far higher degree of local self-sufficiency than they have had for many decades. Interlibrary loans would suffer a dramatic drop, and almost everyone would be satisfied: publishers, libraries, and users.

One of the main barriers to the achievement of this scenario seems to be inherent in the system. If the journals on the CD-ROMs do not receive high or at least medium use, there will be no market for them, or such a small one that the cost will be very high. If, on the other hand, the journals are high-use ones, many people will want to be using them at the same time. This does not cause serious difficulties when only a single issue of a single journal is involved, but when there are numerous issues of different journals on the same disk there is obviously a problem of access. In the early days of CD-ROM, only one person could use a CD-ROM at a time. Multi-user access from several workstations is now being developed. However, while several users can all have access to the same CD-ROM from different terminals, they cannot all use it at the same

*It should be noted that the following comments apply only to journal text on CD-ROMS, not to bibliographical databases or encyclopedias. For a fuller discussion, see ref. 6.
time, although virtual simultaneous access is possible with the jukebox system in use at the British Library Document Supply Centre, where articles are scanned and transferred to memory. The only way round this is for libraries to buy several copies of each CD-ROM, but this would add greatly to the cost and negate many of the savings derived from reduced interlibrary access.

Another problem lies in the use of current issues. Reading on screen is unsatisfactory even when a specific article is wanted. If one wants to browse through a whole current issue to find what is of interest, and to scan a particular article which looks likely to be of interest, there is really no substitute for the printed version. I simply do not see CD-ROMs, or for that matter any online system, serving as a substitute for printed journals for current browsing purposes. If this is so, it means that libraries would have to buy current issues in conventional form and CD-ROMs; the current issues could be thrown away after two years or so, and binding and storage costs could thus be saved, but nevertheless the additional cost would be very high, especially as jukeboxes would probably become necessary once disks exceeded a certain number.

A further problem lies in the price of CD-ROMs. Whatever publishers say, they are making large profits from most established printed journals, and they will be most reluctant to risk losing these profits by selling CD-ROMs cheaply. In any case, the total potential market may not be huge, and it is likely that if CD-ROMs were sold directly to libraries the price would be high, possibly very high. The same applies if CD-ROMs were leased instead of sold, with the additional disadvantage that it would be more risky to discard back runs. At any rate, prices will be entirely in the hands of publishers.

The terms of sale or lease would also be in the hands of publishers. There could be two levels of charge: one, with a high purchase or lease price, that allowed libraries considerable freedom of use, and one, with a lower initial price, that required payment for each use made. Under either level of charge, remote (interlibrary) supply would almost certainly be subject to payment.

Libraries would have to compare the costs of conventional provision with those for CD-ROMs. The cost elements for each are as follows:

(1) Conventional provision
   (a) Purchase price of journals
   (b) Processing costs (acquisition, cataloguing, etc.)
   (c) Binding
   (d) Storage
   (e) Interlibrary access for articles not held.

(2) CD-ROM
   (a) Purchase or lease of CD-ROMs
   (b) Workstations
   (c) Printing
   (d) Purchase of selected journals in high use for current browsing
   (e) Interlibrary access for articles not held
   (f) Use charges for CD-ROMs.
Where there are directly comparable costs, 2(d) would be considerably less than 1(a), and 2(e) would be much less than 1(e). 2(a) and 2(f) are complete unknowns, but 2(a), 2(d), and 2(e) together would almost certainly be much higher than 1(a) and 1(e) together. It is hard to see how CD-ROMs could work out cheaper than conventional journals.

This still leaves open the possibility of using CD-ROMs for storage of back runs of journals. Libraries could then throw away their back runs, or build up back runs for journals in some demand that they did not have, or both. Whether this would be economic is again an open question. If libraries had already incurred large costs in acquiring journals and binding them, buying CD-ROMs to replace them would not be tempting unless they had run out of space. If they did not have the journals, they would need to compare the cost of purchase with that of interlibrary access. Also, as noted above, libraries would have to consider the costs of handling large numbers of disks.

A more attractive possibility, in my view, is to use CD-ROMs for storing, not complete journals, but highly-used articles from those journals. Just as a high proportion of journal use falls upon a relatively small percentage of journals, so within journals a high percentage of use falls on a small proportion of articles. These articles can be identified reasonably accurately from citation analyses, though it is not certain how closely they relate to uses. It is not difficult to conceive of a CD-ROM containing, say, the 10% key articles from physics journals published in the 1970s. Libraries could, by acquiring such CD-ROMs, retain the significant material from their journals, the printed copies of which they could discard and acquire in addition articles for which they would otherwise have to apply on interlibrary loan. This possibility ought to be attractive also to publishers, since they would find an extra market for older issues, albeit only selected articles from them.

There are other possibilities. However, over them all looms the change that CD-ROMs may be a passing phenomenon, to be superseded by some superior form of storage. Not only that, but CD-ROMs are used for text storage only because they use the same technology and production facilities as audio compact disks; they would otherwise probably never have been considered. It is by no means impossible that digital audio tape (DAT) will supersede compact disks; if this happened, it is very doubtful if CD-ROMs could survive. DAT itself might have some applications for text storage. It does not of course allow random access, and all searches would have to be sequential; but it might be used in document supply centres, which could carry out linear searches on requests, say, twice a day and print or transmit the text to requesting libraries.

What might be most useful for libraries is some kind of WORM disk. Publishers could lend libraries journal text on digital tape, and the libraries could scan this and add to their WORMs whatever articles they wanted. What the problems, and costs, of such a system would be is anyone’s guess. I mention it is an example of the sort of possibility that might emerge in the future. If librarians could think carefully about what they would ideally like to have, and agree among themselves, they might constitute a powerful lobby and a sizeable market. To date, they have all been too much driven by technology and what the publishers offer.
Publications, cannot, of course, be supplied unless they have been acquired. As pointed out earlier, international access will be increasingly able to supplement national resources, but for economic reasons alone each country's national resource has to attain a certain level. National acquisition policies and systems need planning: electronic technology can do relatively little to assist them. Where national resources are carefully allocated among libraries, with perhaps some central funding, electronic systems, in particular online union catalogues, can help to maintain some control over how properly the money is being used and how effective the allocation proves in practice. Cooperative disposal and retention plans are also needed to ensure that 'last copies' are not lost to the country. These too would benefit from online union catalogues so that libraries could check whether an item of which they proposed to dispose was in fact held elsewhere; such a system should have the facility to notify the other library or libraries that a copy was being withdrawn, preferably by immediate removal of the record from the file.

6. Other implications of electronic technology

This paper has discussed the impact of electronic technology on the availability of publications insofar as it concerns libraries. However, there is the possibility that libraries might be bypassed. I believe this is, for reasons I have given, unlikely to happen so long as journals are published in conventional form and it is more convenient and cost-effective to acquire and access them in this form. The situation could change if publication in conventional form ceased to be economically attractive to publishers, and if, therefore, electronic access necessarily became the norm. If this happened libraries could be cut out altogether unless they paid the publishers so that their users could have access free. Alternatively, publishers might, to attract a market, deliberately subsidize electronic access so that it became cheaper than conventional journals, which libraries might still be expected to buy for browsing and archival purposes and for immediacy of access. This strategy would run the risk of killing off the conventional version, but in any case it could reduce the role of libraries. Whether or not the role of libraries diminishes depends to a large extent on their continued ability to fund access properly in any form; the funds of many libraries have suffered so much in recent years that this must be a matter of real doubt.

Another possible development that would certainly affect libraries is the use of optical cards for books. An average book will fit on one card, and so, with a portable reader, yet to be devised but well within the bounds of possibility, a user could have a large personal collection of books at his disposal at very low cost; the cost of production of cards would be very small, and would soon cancel out the cost of the reader.

The impact of electronic technology on publications that have text more or less in its existing form is great enough. However, it might actually change the organization of text. Conventional text is not suited to reading on screen. The full use of electronic technology both requires and facilitates different forms and structures. There might be no journals, only articles, though this would
pose some problems for bibliographic control. Articles, and indeed books, might be differently structured, as articulated pieces of information retrievable independently rather than as continuous passages of prose, rather like mini-encyclopaedias.

Electronic technology also affects publications in a different way. With a personal computer and a good printer, individuals can produce their own publications quite easily; the tendency to do so will increase if authors cannot get their work accepted by a commercial publisher because the market is too small. Not only could the work be printed but it could be stored in electronic files at the authors’ expense. The problems this would create for bibliographic control, a necessary precondition of availability, can be imagined.

Electronic technology thus both provides new ways of making publications more available and creates new problems of availability. The possibilities and the problems are enormous. One serious problem is the possibility of an increasing gap in availability between rich and poor nations and between rich and poor individuals, a possibility made more likely by electronic technology because costs are more transparent and charging is easier. Availability of publications could thus become technically easier but less universal. This is a topic for a paper on its own, and is mentioned here only to draw attention to its importance.

7. Conclusion

Electronic technology has already aided the production of union catalogues and access to them, and opened up the possibility of truly world-wide, distance-independent availability of publications. To enable this possibility to be fully realized, better national provision of publications in many countries, better telecommunication links (in particular to facilitate greater use of Group 4 telefacsimile), and standard requesting procedures and protocols are needed. CD-ROMs and other high-density storage media potentially offer scope for greater local self-sufficiency, but both general considerations and experience to date suggest that the scope is likely to be limited. Also, while access could be improved, universality could be reduced.

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UAP in an electronic age


Some of the issues discussed in this paper are dealt with in greater depth in: