Automation and Building Plans

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The planning committee, the president, the architect and everybody else connected with a library building project will have read that computers are making possible great changes in the nature of libraries. They will react in various ways to the fact that one cannot tell precisely what the changes will be, or when, or exactly what the effect will be on their building requirements. They will probably be impatient at times, and suspect the librarian of dragging his feet, but at present there are some questions to which a librarian’s only honest answer is a “definite maybe.”

A part of the difficulty arises from the fact that those who write science fiction about “information retrieval” seldom make any distinction between bibliographic retrieval and textual retrieval. You may have to explain to your committee that the first operation, the identification and location of a book, is accomplished ordinarily through the use of bibliographies and catalogs and indexes, that the second operation consists of taking a book by hand from the shelf, and that computers may be applied to the first operation without altering the second.

It has been demonstrated that mechanized retrieval of bibliographic information is quite feasible technically, and adoption of the MARC II format now provides a basic standard for exchange of such information among libraries. Computer tapes are becoming available commercially for the current output of the British National Bibliography and part of the Shared Cataloging Program at the Library of Congress, and for dozens of “current-awareness” services which are unfortunately mutually incompatible. A great deal more experimentation is necessary before we have a clear picture of the most effective techniques and their economic limits, but a few of the large libraries which have been working on the problem for several years are now trying to develop “integrated” systems.

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In such a system, a library will likely have its own resident computer in which the catalog records, shelflist, order file, subscription file, and loan records will all be inter-related and available "on-line," so that the record may be up-dated or consulted at any moment, and by many people at the same time. The cost-efficiency of an "on-line" system has not yet been demonstrated in practice, and it must be understood that the costs are high. Each installation will begin with something like a million dollars' worth of hardware, and perhaps as much again in development work over the first three or four years, plus ongoing adjustment and operation. However, it is in terms of "on-line" operation that automation could bring about really significant changes in bibliographic control, and for the moment we must assume that the potential improvements in library operation and in library use are great enough to offset a part of the cost and justify the rest.

It seems probable that many large universities within the next decade will have on-line computers in their central libraries, with multiple outlets in the various divisional or departmental libraries, and with some means of making prompt use of bibliographic records which have been generated elsewhere. It is not clear whether smaller universities and colleges will need to have computers and systems staff in their libraries; instead they may have local off-line operations, supplemented by access over telephone lines to information in larger centers. At any rate, every new academic library building should certainly make some provision for the use of mechanized bibliographic information. These provisions, of course, do not affect the normal need for reading rooms and shelf space. They may facilitate the co-operative building of collections and co-operative use, but they will not necessarily reduce the rate of growth. A helpful booklet discussing computers and some of their implications for library building is The Impact of Technology on the Library Building.\(^1\)

The storage and retrieval of text, by computer, is a more difficult problem. It is true that a number of mechanized "data banks," mainly statistical, are now available commercially, and that the contents of some of them could be made accessible to users of university libraries. It is true also that some abstracting services and some collections of analyzed text are available commercially in coded microform which can be selected mechanically and projected on a screen or photocopy plate, and that these devices could be useful in handling limited bodies of data. It is true also that some knowledgeable
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people foresee the library of the future as a system of bibliographic retrieval linked automatically to a stackroom full of coded microtext—but here the crystal ball becomes very dark, and illumination awaits major changes in the arts and economics of publication, and miniaturization, transmission, and reproduction of text, as well as revision and clarification of copyright laws and acceptance by users of substitutes for the book. Whether these changes will come about, or when, or exactly what their effect would be is difficult to determine. For instance, if the whole body of the world's publications could be condensed into a desk-sized cabinet and called forth one page at a time at will, as has been seriously suggested is possible, then perhaps present library facilities such as reading rooms and stackrooms will have to be filled with hundreds or thousands of such desks. Meanwhile the annual production of print rises every year, in many languages and in many forms, and each library buys what it can to meet the most urgent local demands. Now that some factual data are being published only in machine-readable form, librarians will acquire it and find a way to make it available, but we are a very long way, I believe, from the use of computers for textual storage and retrieval of general library collections.

In planning a university library one cannot, therefore, assume that computers will make any difference, at least in the next ten or fifteen years, to the growth of the book collection or to the need for study space. After that time one may hope that some technological and social miracle may begin to dampen acceleration in the growth rate of the book collection, and that it will not create too great a demand for new and specialized study space. Given the uncertainties, a librarian will want a building as flexible and adaptable as possible, within the ordinary economic limits of flexibility. Librarians should assume that within the next few years the library may have its own computer to serve a fairly comprehensive system of bibliographic control. It will be a new and better can-opener, not a new kind of diet.

The architect planning a new library building, having accepted the above generalities concerning the future of the library, will begin to ask for facts and figures, and for these you need to seek up-to-date advice. I suggest librarians not rely on the advice of computer consultants who have not worked on library systems: they will judge correctly that bibliographic control does not make heavy demands on computing power, but they are almost certain to underestimate
the required storage capacity and the complexity of providing ade-
quate access to that storage. They are likely to underestimate the
high volume of input and output, the sophistication of the required
system, and the time and money needed for adequate planning and
development. Now that there are several libraries working in the field,
librarians would do well to ask for their latest findings about scale
and types of equipment to do the tasks required. Having developed
a general idea of the scale, librarians will find local suppliers quite
eager to give them specifications as to line-load, cabling, heat-load,
floor-layout, and so on. Unless the library is already committed to a
particular make of equipment, it should not become obligated to
any one manufacturer at this point. The library market has not yet
inspired anyone to design equipment that is really suited to library
operations, and a library should be free to put together machines
of various makes in order to arrive at a configuration which suits
its particular needs.

During the design stage at Toronto, in the summer of 1966, we
invited our architects and engineers to an all-day seminar with two
imported consultants who had worked and published on information
systems. The consultants had not met before and had different views
of the future, but by the end of the day we had reached a consensus
on the points that were important to the architects. In general, we
agreed to gamble on computer cables becoming lighter rather than
heavier as the equipment improves, so that eventually they might be
carried in the regular three-duct underfloor system which is to be laid
in most of our office floors for power, intercom, and telephone. For
the initial stage, we had agreed that the data processing center would
be connected to a vertical coaxial cable space running from an exit
port in the basement up to a possible aerial connection on the roof.
It was agreed that the vertical trunk line, which could be tapped
at any floor, would feed a few horizontal trunk lines laid in the floor
to serve these areas in which we could foresee the need for outlets,
and that other horizontal lines would have to be installed later when
and where they were needed. A complete grid of coaxial cable con-
duits in every slab would have been the neatest solution, but was
thought to be more expensive than later modification to meet spe-
cific needs.

The horizontal cable trenches will run to nearly all public service
points and control points, and the public catalog areas, as well as
the technical service departments. They also serve a number of
carrels in the audio-visual study area, so that we may be prepared for some preliminary experiments in the automated retrieval of text. New horizontal feeders which may have to be added in the future will be carried above false ceilings, where those exist, or else in trenches cut into the three-inch layer of light topping on the floor slabs. We may of course live to regret our gamble, and even now would sleep more soundly if we had been able to lace our floors with large cable conduits. The Library of Congress has a much safer provision in the plans for the Madison Memorial Building, which show a three-duct system laid at five foot centers in most of the floor slabs above the two basement levels. The ducts are to be three inches deep and six, six, and twelve inches wide to handle power, telephone, and coaxial cable respectively. The cost of this duct-work is estimated at about $1.50 per square foot over an area of about one million square feet.

In Toronto the computer will be near the center of the building and in a location which is convenient to staff, on the eighth floor, just above the technical service departments and just below the bookstacks. It could have been anywhere, really, and there would have been some advantage in having it in the basement next to the supply of cooled water. We were tempted briefly by a suggestion that it be on a public service floor or at grade level, with a glass wall for the convenience of sightseers, but decided that we could not afford room for it on a public floor. The working drawings show approximately 4,000 square feet of raised floor to house the “customer engineering office” (twelve by twenty-five feet), the tape-disc-program library (twelve by thirteen feet) and the Sigma 7 computer which will be moved in from its present temporary quarters. The raised area has a ramped entrance and is completely enclosed to permit special air-conditioning. The raised floor is twelve inches above the finished floor level, and the walls enclosing it are largely glass, partly for the benefit of visitors. Alongside are offices for the systems manager and staff, amounting altogether to another 4,000 square feet of assignable work space. The space is assumed to be enough for the initial installation and a reasonable amount of development; any radical expansion in this part of the operation would presumably imply a reduction in technical service staff and office space or in stack space, and could be found by substitution in those contiguous areas. Beside the raised floor is another area which could eventually be raised and given extra supplies of power and cooled water.
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I mention these details of planning at the University of Toronto not as a model to be followed, but simply as an example of what was accepted by one library in the summer of 1968. The detailed planning of our computer system is far from complete and will go on changing as we gain experience and as the machines improve. Since new generations of equipment tend to be smaller and faster and cooler, and to need lighter cables, we hope that we have provided amply for at least the near future. To be safe, before a library commits itself, however, it should get the latest prognostications from several sources.

To be absolutely safe, of course, in the face of present uncertainties, a library should tell its architect to go away and come back in twenty years, when more is known. However, if a university needs library service in the meantime, its librarian can only consult the omens, make a good guess and be prepared to find when the building is finished that his guess was not always completely accurate.

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