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THE IMPACT OF TECHNOLOGY ON THE LIBRARY BUILDING.

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LIBRARY PLANNERS SHOULD EXPECT AUTOMATION, MICROFORMS, AND FACSIMILE TRANSMISSION TO MODIFY BUT NOT RADICALLY CHANGE THE LIBRARY AS THE INSTITUTION WE NOW KNOW IT TO BE. CHANGES WILL INVOLVE TRADE-OFFS IN SPACE AND DEMANDS FOR ADDITIONAL SPACE. (MF)

The Impact Of Technology On the Library Building

EDUCATIONAL FACILITIES LABORATORIES

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The Impact Of Technology On the Library Building

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BACKGROUND

The image of the library has been as immutable as the shape of the steeple in a village landscape. Time has given these forms the stamp of authenticity. Within the past decade, however, cracks have been appearing in the library's facade—and they are growing wider.

Computer technology, microform technology, and developments in communications, have created a potential for the storage, retrieval, and exchange of information beyond any means ever before attainable. Indeed, Sunday supplement writers, fired by the far-reaching visions of pioneers in these fields, declare that the book will become obsolete. It will be an artifact exhibited in museums, they tell us, its functions assumed by electronic circuitry. And libraries, as the institutions we have known them to be, will be things of the past.

This hypothesis, as Mark Twain reported on the news of his death, is greatly exaggerated. The book, which appears to have extraordinary survival power, has stood up thus far against the real and imagined threats of radio, film, and television. Witness its career since 1945, for example, when general television broadcasting began. The circulation of public library books in the United States has increased by more than 200 percent; and from 1960 through 1965, the numbers and titles of new books, and new editions of books produced in the United States, increased by more than 90 percent.[1] *Publisher's Weekly* reports that the past two years were banner years for book sales, continuing an upward trend in annual over-all book figures for more than a dozen years. In 1965, dollar volume ran to over 2 billion.[2] In 1966, how to meet the bottlenecks in production and delivery caused by the demand became a major industry issue.

The survival powers of the book notwithstanding, technological changes in the making *could*, one day, profoundly alter the traditional operations of libraries—and their buildings. And those within the profession, as well as college and uni-

versity presidents, trustees, governing boards of public libraries—all those responsible for planning library buildings and committing large funds to their construction, are concerned.

This concern is by no means a matter of resistance to change. On the contrary, library professionals are acutely aware of the dire need for new solutions to mounting library problems. Major among these is the flood of new information. Most of the nation's libraries are hard pressed for money to buy, and space to house, the torrent of books and journals pouring off presses around the world. There are 400,000 books published annually worldwide, roughly twice that of a decade ago.[3] In the sciences alone, where old-fashioned physics, biology, and chemistry have bred new fields like biomagnetics, macromolecular physical chemistry, and cryogenics, to name only a few, there are 35,000 separate journals published annually with over 1.5 million articles in them. The journals themselves are estimated to be growing in number at the rate of 5 to 10 percent a year; the literature in them doubling every 10 to 15 years.[4] The Library of Congress owns 54 million items. Cornell University catalogs over 85,000 titles a year. And if one considers that academic and research libraries tend to double the size of their collections every 16 to 20 years—then, in the words of mathematician J. G. Kemeny, "the cost of building, of purchasing volumes, of cataloging, and of servicing these gigantic libraries could eventually ruin our richest universities." This says nothing of the difficulties that lie in wait for the user as he approaches the card catalogs of awesome dimensions, or the reference librarian who is estimated at the present time to walk an average of eight miles a day on the job.

How to cope with it all is by itself a subject of prolific literature in the library world. Librarians themselves are the first to recognize that the solution is not simply more books, more buildings, and more librarians. What they look forward to, and *need*, is a change in the very concept of what a library is: that is, beyond its function as a depository of books, the library must become a source of active information transfer. The new technologies offer the long-range hope of realizing this concept, and librarians, above all, welcome it. Through computer storage and retrieval, microforms, long-distance transmission, and the like, it may yet be possible to multiply the usability of every information unit, to transcend the physical and geographic limitations of the library building, and ultimately, perhaps, to make one's home or office in Kimberly, Idaho as fruitful a place for learning as the best public, academic, or research libraries in major centers.

But to what extent this will ever be a reality is the big question. Almost as important is the question of when.

The answers are urgent because well-planned, flexible buildings erected today can serve for 100 years; because current construction costs per square foot for library building space range from $25 to $40 per square foot depending on the region of the country and other variables, with total project costs running roughly a third more, including fees, furnishings, and the like; and finally, because we are in a period of intensified activity in library construction.

Increased population, greater numbers of young people going farther in higher education, federal assistance, the opening of new fields of employment, greater leisure time—and present library deficiences which are acute—are behind the building surge.

The Office of Education reports that, among public libraries, though capital outlay soared from $12.3 million in 1956 to $103 million in 1965, prospective capital expenditures to construct 68 million gross square feet of public library space by 1975 come to $1.9 billion.[5] Still, this will not satisfy the full needs, estimated to be more than 90 million square feet by 1970.

For libraries in public and nonpublic schools, estimates are that more than 3.4 billion square feet of space will be necessary by 1972.

And in institutions of higher education, the in-

dications are that more than 135 million new square feet of space will be required by the same date.[6] Scheduled for construction in two- and four-year colleges are 1,200 buildings to go up between 1966 and 1970. Their anticipated cost, including furniture, comes to $2.17 billion.[7]

Given the magnitude of monies already committed, and the additional sums likely to be so allocated, it is little wonder that librarians are deeply concerned. If it is a fact that in the future the bulk of knowledge will be stored on magnetic tapes or greatly reduced microforms and fed into computers; that information transactions will be negotiated through terminals located at home, in the dormitory, the classroom, the office, or in service stations remote from where information is stored; and that information will be transmitted to users over long distances, then indeed it is imprudent if not illogical to plan costly structures to house nonexistent books and their readers.

The questions that hang over the heads of library planners are (a) the probability of these propositions, and (b) whether they will be true for all types of information, in all types of libraries, in small ones as well as large, (c) whether they will be economically practical or prohibitively expensive, and (d) the speed of change.

Between the myths and the realities, between the over-simplifications of the space-age writers and the arcana of the new sciences, planners are caught in a web of dilemmas.

It is not uncommon to encounter representatives of small liberal arts colleges, influenced by the space-age prose, who are afraid they have fallen behind the times because their libraries lack automated information systems. In fact, such highly sophisticated operations are at present confined to a very few specialized national libraries such as the National Library of Medicine or the American Chemical Society. These deal mainly with bibliographic material, not text, and almost all of them are in some important aspects still experimental or developmental. Similar misconceptions exist in relation to automated "housekeeping" processes such as circulation, acquisitions, serials control, and the like. While these chores are in fact automated in many libraries, it is at present more economical in small ones to manage them in the traditional mode. There are still other situations where new library facilities are desperately needed, but planners are sitting tight, chary of committing sizable funds to structures that may turn out to be anachronisms.

Clearly, there is a need for shared expertise and for common sense in its application. Those with responsibility for decision-making must be informed of the implications of the new technology and provided with guidelines so they can proceed with confidence that the buildings they plan today will be usable in the future. The present state of the art of library architecture, based on modular principles which allow for interior flexibility, has until now provided that confidence. We knew that such buildings, appropriately located, capable of expansion, and with provisions for the addition of electric and air-conditioning loads, could serve as well in the year 2067 as they do today.

But in the light of the unfolding possibilities for the management of information, do these principles remain sound and adequate?

To probe for viable answers, EFL arranged a symposium of experts from the relevant disciplines. Communications and information technologists, librarians, and architects (see appended list of participants) met at EFL's offices in New York City on June 7th and 8th, 1967. Broadly, they addressed themselves to the impact of technology on library buildings. Their task was to separate rhetoric from reality, fact from fancy. Specifically, they explored the wisdom of continuing to build libraries along traditional lines, and plumbed available knowledge for cues on how to prepare buildings to adapt to the new era.

Two days of discussion explored four principal areas of relevance: computer technology, microform technology, communications technology, and the relationship of human beings to the possible changes ahead.

Other points dealt with, in addition to those noted earlier, were the cost of envisioned programs; patterns of library use; how the library may absorb particular innovations or be absorbed by them; centralization, decentralization, and networks; the implications for space requirements, mechanical provisions, and the physical environments of buildings.

Every question could not be fully answered either for lack of time or because there are no answers at this point in time. The critical questions, however, were covered. What follows represents the consensus of views expressed concerning the impact of technology on library buildings over the next 20 years or so, beyond which period forecasts would take on aspects of pure speculation. It is EFL's hope that they will resolve for the present some of the uncertainties that beset the profession, and provide a guide to assist planners in the approach to their task.

1. *Illinois Libraries*, Vol. 48, No. 7 (September, 1966), pp 562-63, as quoted in R. J. Blakely, "The Wit to Win," *ALA Bulletin*, Vol. 61, No. 2 (February, 1967), p. 168.
2. "Statistics, News, and Trends in the Industry," *Publisher's Weekly*, Vol. 191, No. 5 (January 30, 1967), p. 46.
3. Figures for 1964, from *Statistical Yearbook, 1965* (Paris: UNESCO, 1965).
4. "The Literature of Science and Technology," *Encyclopedia of Science and Technology*, Vol. 7 (1960 ed. updated in 1966; New York: McGraw-Hill, 1966), p. 542.
5. Nathan M. Cohen, "Public Libraries," *Public Facility Needs* ("State and Local Public Facility Needs and Financing," Vol. 1. Study prepared for the Subcommittee on Economic Progress of the Joint Economic Committee, Congress of the United States [Washington, D.C.: Government Printing Office, 1966]), pp. 616-624.
6. Estimates of need in public, school, and college and university libraries, prepared by Henry Drennan, Acting Chief, Library Planning and Development Branch, U.S. Office of Education, 1967.
7. Data from unpublished report, "Projected Construction and Financing of College and University Libraries, Fall 1966 to Fall 1970," prepared for EFL by Consultants to Industry, Inc., Stanford Professional Center, Palo Alto, California, in 1967.

COMPUTERS

The first substantial application of the computer to library processes began in 1959, propelled by the scarcity of librarians, the rapidly soaring costs of processing books, and the increasing flood of publications. Since that time there has been a great deal of pioneering work in most areas of library operations, usually in large libraries, and with varying degrees of success. These early attempts have been to a great extent random and unrelated to each other, even competitive, with programming developed for local operations only and with scant or immature reports of results.

Four areas of library activities have been repeatedly attempted—bookkeeping operations connected with the ordering and receiving departments (in many libraries); the handling of catalog data for books, sometimes accompanied by book catalogs printed by computer (such as that at the University of Toronto); circulation control (such as that at the University of California at Los Angeles); and information retrieval of technical data, law citations, bibliographical citations, and most ambitiously, the MEDLARS program at the National Library of Medicine. The latter results in computer production of the *Index Medicus* and the searching of information contained in it on demand. The Library of Congress now has under way in Project MARC a series of ambitious experiments in computerized library processes, concentrated at present on the handling of catalog data. Since the Library of Congress is pivotal, to the degree that these experiments are successful they will affect the entire library world.

Many of the results obtained to date are impressive, but conflicting claims have created confusion about the entire field of computerization in libraries. The questions facing any library interested in computerization today are—Should we computerize, when, and why? What should we computerize? What are the costs involved, and should we accept them? What relation will local computerization have to regional or national com-

puter projects, such as those of the Library of Congress? What information about library computerization can we depend on?

The course of computer development and use within the library over the next 20 years is likely to proceed as follows.

Its first general impact will be in the area of housekeeping chores—order records and reports, fiscal control, circulation systems, etc. Application of the computer to bookkeeping operations, such as buying and receiving, is the easiest to accomplish. Moreover, it is the area in which considerable experience in many libraries to date indicates clear cost advantages in large operations.

The second field of general application—and impact—will be the computerization of the library card catalog. Some aspects of this are now technologically feasible. The promise is that this will extend greatly the usefulness of information contained in the present card catalog. Its advantages lie in its accessibility to users beyond the library, in permitting the interchange of catalog information between libraries, and in mobility within the library itself for checking holdings, changing location records, and the like. While the conversion of any library operation to automation must be undertaken with the greatest care and planning because of the very large costs involved, this is especially so with regard to computerization of the card catalog.

Totally aside from costs, there are technological and intellectual problems of the greatest magnitude to be overcome before computerized catalogs will be generally usable. Direct access files of larger storage capacity than presently available in computer systems will be required to store the catalogs of great research libraries. The capability of simultaneous consultation of the catalog by very large numbers of users must be expanded (the present limit is about 30). Problems of what terms and how many to use in describing catalog information must be resolved. Programs to retrieve only the materials specifically required by a user must be developed. But, despite these problems, it is

expected that within 10 to 20 years, the use of computerized catalogs will be widespread.

When dealing with the storage and retrieval of text, equally formidable problems exist. Data or factual evidence of small unit size is easily manipulable by the computer, but much more complex bodies of thought or of knowledge are not. As of the present, it would appear that most of the literature in the humanities and social sciences will remain primarily useful in book form. There is no signal advantage in converting Plato's dialogues to machine readable form and retrieving them or juxtaposing them by the computer. It is therefore economically senseless to attempt a massive conversion of existing library books to machine readable form, since the advantages of doing so are minimal in many subject fields, and the costs enormous. The change to computer storage of full texts, when it comes, will be evolutionary, not revolutionary, and it is unlikely that the library as a repository of books will be replaced in the near future by a computer in the basement consulted by remote consoles.

The first phase of development in information retrieval will use the computer to store and retrieve highly used specialized data, probably in nonalphabetical languages, in the physical and life sciences—as is now being done on a limited scale. Sometime later, perhaps within 10 years, the texts of some highly used materials selected from current science and non-science publications will be originally published in computerized form. But for the next 20 years or more, the great bulk of publication will be in conventional print form, with a gradual increase in the production of microform texts. Retrospective conversion of texts to machine readable form is not expected to any great degree for a very long time in the future. Therefore, the bulk of a scholar's negotiations in a library will be with books even 30 years from now.

MICROFORMS

The vision of carrying the Library of Congress around, in miniaturized form, in a shoebox, has long been held—and in a smaller way, projected and abandoned at Wake Forest College.

The use of microfilm to preserve deteriorating material, to reduce the size of bulky materials such as newspapers, and to facilitate transfer of texts from one library to another, dates back to about 1935. The microfilm was soon joined by the microcard, heralded as a great space saver for research collections. For about 20 years, the principal use of microforms in libraries was to store the texts of newspapers and periodicals to save space (and to preserve the text). With the proliferation of printed material, especially of technical reports, in the fifties, pressures for space generated many new types of microforms and experiments to reduce their size. One of the latest of these is that recently announced by the National Cash Register Company, which has succeeded in writing a two-micron line width (a size equal to about half the width of a red blood cell) with a laser beam. In terms of storage, this means that 10,000 pages could be recorded on an area the size of one page. The distribution by the government of NASA and Atomic Energy Commission reports in microfiche added further impetus to the microform world. And recently, there have been repeated attempts to adapt microforms to computer systems for automatic retrieval of documents.

At present, the usefulness of microform technology is minimized by the fragmented nature of the industry. This has resulted in a lack of standardization in the production of microforms. The past few years have seen a rapid multiplication in the kinds and shapes of microforms which are not compatible, have little or no relationship to each other, and are in fact mutually exclusive. Advances in use will depend on standardization of a reasonably restricted number of kinds of microforms, and on the production of a system of machines interrelated so that their output can be

automatically converted, quickly and cheaply, from one form to another. It must be possible to convert from micro to micro, micro to large, and large to large, producing retention copies of such quality that copies of the copies can be made with no deterioration of the image. In addition, and most important, there must be equipment for consulting microforms that is inexpensive, easy to use, and that has excellent legibility.

These developments do not seem likely to occur in the near future. Progress in the field is slow since there is no single firm in the industry that plays a dominant role in setting the pace for all of the others, as was the case with IBM in the computer field.

In the view of the participants, the long-range effect of microfilm technology on the book and library building will be greater than that of the computer. In the short run, i.e. the next 20 years or so, while the use of microforms will gradually increase, they will not replace the book in a significant way.

COMMUNICATIONS

Facsimile transmission of text over long distances holds enormous implications for the library world. Contained within it is the potential solution to the problems of duplication, unmanageable growth, and rapid access.

While it has been possible since the advent of television to transmit images of text over long distances, the impermanence of the image makes this unsatisfactory for library use. The recent development of machines for facsimile transmission which print out text at the receiving end has added a new dimension to communications technology. And there are now experimental projects under way which substitute the transmission of text for interlibrary loan: one between the campus of the University of California at Berkeley and the University's Davis campus; the other among libraries in New York State.

Facsimiles of text printed at the receiving end are transmitted by conventional telephone cables or microwave stations. Since this requires a broad band transmission channel, the line costs are very high. The costs of microwave transmission are still higher. Even more restrictive is the lack, at present, of a national switching system that would allow rental of a broad band channel for a few minutes of time to any geographic location, which interlibrary transmission requires. And even if educational communication satellites were available today to facilitate transmission, the lack of an adequate switching system on a national scale would prevent facsimile transmission of text from becoming a common means of information exchange for libraries.

Eventually, a common carrier network, equipped with adequate switching, is likely to be set up to accommodate such developments as the PICTUREPHONE and the transmission of data between computers. If this develops, the system would serve well for library needs.

Such a common carrier network is within the present technology, but the economic basis of the service has yet to be established. Initially, the service may be too expensive for libraries. Also, such a network cannot be suddenly created but must grow over a period of years.

Regional, national, and special purpose libraries will become increasingly important. To be effective, adequate communications must make these centralized facilities available over a wide geographic area. An initial arrangement practical with present communications, consists of published or microform catalogs plus distribution of the documents by mail. (Witness MEDLARS, for example, the most sophisticated computerized retrieval system, which now sends the results of its bibliographic retrieval by mail.) The catalogs could be widely distributed and enable remote users to locate documents which they would then receive in a day or two. As a broad band network develops, fast electrical transmission of both bibliographic and textual material will gradually

evolve to replace mail service. The time scale will depend very much on the particular region. Big cities like New York, Boston, Washington, Chicago, Denver, San Francisco, and Los Angeles may be firmly interconnected within 5 years, but it may take 30 to 40 years to reach Peru, Nebraska.

When it materializes, the use of facsimile text transmission between libraries may be economically practical. It would be unwise, however, for the next generation of libraries to depend on its general availability. It would appear at present that, while bibliographic citations will be exchanged electronically, in the face of competition from more conventional and vastly cheaper forms of haulage like trucking and mailing, facsimile transmission of books and documents will be restricted for a long time.

Pertinent too, is the matter of copyright ownership of text and other intellectual products, as applied to electronically stored and transmitted materials as well as to all forms of photoduplication. Legislation pending in Congress acknowledges the need to extend copyright protection from the traditional to the new formats. The problem is not one that lends itself to easy solution, however, and until viable arrangements are evolved, this will pose a barrier to realizing the potential of the new technologies.

With regard to the implications for buildings, since facsimile text transmission is simply a newer and better form of interlibrary loan, it would have no significant effect on the interiors of library buildings. It would, however, slow down the rate of expansion since research materials easily obtainable from regional and national resource centers would not need to be bought for local storage.

IMPLICATIONS FOR BUILDINGS

Computers: Even if a library were completely computerized, there would be no necessity to locate the central computer equipment within the library building. If local considerations should

make it desirable, however, a total of some 2,000 square feet apportioned as follows, along with the environmental conditions described, would provide the needs for a library of a million volumes.

1. The central processing room: This does not need to be large since the processing needs of even a large research library are well within the capacity of quite small computers (in terms both of physical size and of processing speed). A thousand square feet is adequate, but the space should be planned to accommodate a progression of facilities. (That is to say, a library might opt initially for a punch card installation or a small-scale computer, and would use this facility for certain clerical functions for two or three years. At that time it might decide to employ a machine of larger capacity. Some years after that, it might decide to incorporate on-line processing in the facility, and then, at a later date, establish on-line connection to a much larger utility computer located elsewhere—such as in the computer center of the university or a commercial computer utility which may possibly be in existence by 1980.)

The central processing room should be located away from all reading areas and acoustically controlled to contain the noises produced by the machines. It should have a double floor, with a one-foot space below the standing floor to carry computer cables. Also, a separate air-conditioning system to hold the temperature at 75°F. and relative humidity at 50 percent. (This has particular significance for the magnetic tapes which tend to change their operating characteristics under excessively low or high temperatures.) There should be a continuous recorder for both temperature and humidity, with an alarm set to indicate dangerous variations of either, and a cut-off for the air-conditioning system located within the room. It should have the best possible filtration system to remove dust from the air, such as a pad filter backed by high efficiency bag strainers rated at 95 percent. Dust control is necessary, again, primarily because of its effect upon the reliability of magnetic reading and recording systems. Power

requirements will depend on the machines used, but a typical load is 20KVA at 175 amps. Because a stable power source is essential, surges must be controlled to within 5 to 10 percent. A continuous voltage recorder should be provided, again with an alarm set to indicate dangerous variations and a cut-off for the power located within the room.

For connection to peripheral terminal units throughout the building, there must be a flexible system of electrical conduits both vertically between floors and horizontally on each floor. Likely locations for terminals are the catalog, acquisitions, circulation, and serials departments, and the card catalog itself. Any terminals that involve card-handling or typewriter equipment will make noise, and provisions must be made to control it. There must also be provisions for running cables out of the building from both the computer processing room and the peripheral terminals, to reach a larger computer facility for special or rapid processing—or, in the remote future, to tie into computer networks.

2. Ancillary spaces required, are these: Two offices convenient to the central processing room. One, for the computer director, operators, and programmers, should allow 150 square feet per person; the other, for key-punch operators, 75 square feet per person. Immediately adjacent to the processing room should be two additional rooms of 100 square feet each; one for mechanized storage forms such as punched cards, tapes, etc., the other for spare parts and testing equipment. Finally, storage of cards, forms, and other supplies should be provided in still another room of about 200 square feet near the processing center. The entire complex of rooms should be provided with the same atmospheric conditions as the central processing room itself.*

Seating: The impact of technology on seating in academic libraries is likely to be slight. With an

*Architects recommend that computer manufacturers be consulted in the programming and planning of these spaces, as well as in the mechanical and electrical requirements necessary in each situation.

increase in the use of electronic carrels, dial retrieval, computerized retrieval of texts, and teaching machines, the formula for square footage allowed per reader will have to increase. Even with a great increase in the ability to receive information from remote sources, the dormitory room is not likely to replace the library. The present surge of students to the library for concentrated, disciplined study, especially at times of academic pressure, is not likely to be rendered less by technology, and will probably increase. Demand for seating in the science sections may diminish, however, since that class of information will be most heavily computer-stored and retrievable in laboratories, offices, and points on the campus remote from the library. The more that technology facilitates access to information, the more will information and libraries be used, which will tend to increase, not reduce, library workloads and the size of library facilities.

The Card Catalog: Changes in the card catalog will generate physical objects to take its place—multiple copies of book catalogs or many consoles. Great change in the form of the catalog would not involve much change in planning a library building at this time.

Shelving: Modification or redesign of shelving now provided for books will be necessary to hold forms of information of smaller unit size than books, i.e., microforms, magnetic tapes, etc. The smaller unit size will not reduce total space requirements, however. As microforms become easier to use—as they must if they are to replace books to any significant degree—the very ease of their use will then accelerate their purchase. Together with the installation of machines for their retrieval, the result will be a shift in space or even an expansion of space requirements. Since shelving will have to be moved, the preferred practice of using free standing stacks will be even more important in the future.

While a library built today is not condemned to early obsolescence by the new technology, the

changes in store do place a greater premium than ever on planning buildings to be adaptable. The column system should be coordinated with the lighting layout, and with stack and furniture modules, so that shifts between seating and shelving are easy to make, and rearrangements of partitioning inexpensive. Perimeter and underfloor ducts should be provided large enough and in sufficient numbers to allow access to cables and electrical wiring at unpredictable locations on the floor, and to run easily from one floor to another. Air-conditioning shafts throughout the building should be oversized to provide room for additions to the air-conditioning system.

It is also important to avoid illumination levels above 70-80 footcandles, maintained, which tend to bleach out the image on computer display terminals, television screens, microfiche projectors, and other rear-screen projection equipment. Indeed, it will be necessary to lower the light intensities in areas of the library as they become occupied by these machines.

In sum, it is the consensus of those who participated in the conference that for at least the next 20 years the book will remain an irreplaceable medium of information. The bulk of library negotiations will continue to be with books—although the science and technology sections will gradually shrink. Remote retrieval of full texts in large amounts over long distances will not be generally feasible, and the continued use of a central library building will still be necessary.

It follows, therefore, that library planners can proceed at this time with confidence that technological developments in the foreseeable future will not alter radically the way libraries are used. In planning library buildings today, we should start with the library as the institution we now know it to be. Any departures in the future should be made from this firm base.

To be sure, technology will modify library buildings. But the changes will involve trade-offs in space and demands for additional space, rather

than less. Thus, buildings planned now must be planned for expansion. And at the same time, it is imperative that an added cost factor of three to five percent should be allowed in order to assure adaptability, especially in the electrical and air-conditioning systems.

This should not invite complacency, however. Predictions in a swiftly changing society are a risky business and must be hedged with caveats. All the fields of technology are swirling with action, and it is certain that, in every individual library, planners and administrators must be constantly alert to innovations, to local potential for assimilating developments, to the possibilities for interaction between libraries. On a broader scale, continued research, experimentation, and study must be carried on to help solve today's planning problems. Technological progress perforce will continue. But it is not breakthroughs that are going to make a new world so much as the constant accumulation of new experiences over a considerable period of time.

Finally, we need much more consideration than has yet been given to the library user. Any applications of technology to library activities will have to be engineered to be humanly acceptable, since there will be resistance to them all—to the use of microforms in place of books, to console-typed texts instead of print, to engaging in complicated interaction with a machine, to reading in a fixed place without moving around. The machines will breed their own resistance to the extent that they place restrictions on people.

Now, more than ever, it is important to design library buildings so they will be inviting and comfortable for people to use. The library building itself will gradually change, but people, who use libraries, are a constant factor.

July 1967