

## IMPLICATIONS FOR LIBRARIANSHIP OF COMPUTER TECHNOLOGY

Robert M. Hayes

In this century we have witnessed the growth of an almost unbelievably complex society. We have seen society change from an essentially rural one to an essentially urban one. At one time, each man knew his neighbor, his town, and his role and his station in life. The role of government, if it was felt at all, was simple. We have seen the change from an essentially agricultural society to an essentially industrial one—even our farms are now largely factories. We have seen the increasing integration of our society into a single whole—an integration wrought by modern transportation and communication, an integration requiring a corresponding social organization. We have seen an ever broadening size of scope of that social structure—until now it is close to encompassing the entire world. We have seen the ever increasing impact of technology—until we have learned not only to accept change but even to expect it. We have seen an ever increasing specialization—an essential ingredient of complexity—until the day when one man could legitimately be viewed as a universal genius is long past. We have seen an ever increasing magnitude, in both breadth and depth, of recorded knowledge—until the day when one man's personal library could be the basis for a national library is similarly long past.

Such complexity, by its very nature but even more because of the speed with which it has developed, must pose problems of corresponding magnitude. National economic problems, industrial management, technological development, social change—all involve decisions of great magnitude, and their impact is felt throughout the social structure precisely because of the complex interactions among its component parts.

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The day is past when the information needed for these decisions could easily be remembered by the decision-maker himself. The day is past when a delay of weeks or months in a decision could be tolerated—our society is just too complex, and without an adequate memory and rapid flow of information, it will go the way of the dinosaur.

We have all kinds of mechanisms to ensure the rapid flow of new information—but the effects of much that happens now will be recognized as significant to future decisions only long afterwards. Furthermore, much of the significance depends upon the very accumulation of information.

Thus, the complexity of our modern society—science, technology, government, business—has become so great that its very existence is made possible only through correspondingly complex mechanisms for communication, processing, storage, and retrieval of information about itself and the results of its functioning. This may appear to be overly dramatic, yet its truth is demonstrated by the ever increasing number of information centers, “data-banks,” centralized files, and special libraries; the evidence for its importance lies in the ever increasing concern in science, technology, government, and business that these mechanisms meet their needs for information. The nature of those needs, wherever they exist, is that they are relatively ill-defined and represent a great variety of mutually conflicting requirements. The problem is to meet them within severe economic restraints, so that the “information system” does not itself become a burden.

It is this which constitutes the challenge to librarianship, and all the concerns of the moment—with “mechanization,” with “centralized processing,” with “economic operation,” with “system analysis”—are merely symptomatic, merely the evidence of the crying need for professional knowledge of how to meet the demands for information—ill-defined though they are and severe though the economic restraints may be. Because librarianship does represent the sole existing source of professional knowledge and operating experience in the field of information handling as such, it is librarianship which now feels the pressure of these needs. If librarianship does not meet this challenge and fill the need for professional knowledge, someone else will, but in the process they then must develop the same tools and capabilities which librarianship now provides.

It is my belief that, in large part, the implications of the computer to librarianship today are a result of these pressures and that the real aims should be to lead the profession in meeting the needs for professional knowledge. To support this belief, the impact of the computer on librarianship will be discussed under five categories: (1) operational implications—the computer in the library; (2) systems implications—our national information system; (3) professional implications—the need to understand and to control mechanization,

with knowledge and wisdom; (4) educational implications; and (5) theoretical implications.

Operational implications.—The concern of the library profession with the ever increasing costs of operating complex library systems is representative of comparable concern in all information activities throughout the country. And it is natural to search for the answer to such concern in a better solution to operational problems, and particularly to look for it in the techniques of methods analysis, mechanization, and cost control; therefore, this has been perhaps the most evident impact of the computer on librarianship. In addition, external pressures from administrators, engineers, salesmen, and others, all asking, "Why don't you automate?" have made this impact painfully evident.

However important the application of these approaches may be for the solution of operating problems, they simply represent the tools of good management and not the substance of the problems in librarianship. There may be some particular aspects of them which are significantly difficult when applied to librarianship, but fundamentally and in general these tools of good management are not going to have any lasting impact—at least not on librarianship as such. At most, therefore, the aim should be one of educating the profession in the use of these tools, in the special problems in applying them to libraries, and in their relation to the more basic problems in librarianship. In this respect, much of the groundwork has already been done—the profession has been educating itself, has carried out analyses of library operations, has experimented with mechanization, and is developing better concepts of cost control.

It is in part for this reason that this speaker would be concerned if this area became the predominant focus of future concern with automation. It is my feeling that at most the need is to complete the process which has already been underway in the profession.

Systems implications.—It is at times difficult to make a distinction between operational problems and systems problems; they overlap and interact, and one man's operational problem is part of another man's systems problem. However, within the context of a national library system, the distinction can be made between those considerations which are local—within a single library or university campus, say—and those which are nation-wide. Interlibrary cooperation is, of course, not a new concept, but rarely has it been done on an integrated basis. It is clear that some degree of centralized processing and allocation of resources can produce not only a more efficient total operation, but even a more responsive one. The systems problems arise from trying to integrate the component libraries for maximum efficiency, without degrading the services locally. The problems in reconciling the conflicting requirements of local operation and system integration are difficult ones. The system

implications of MEDLARS, say, or automation in the Library of Congress, or a National Science Library, are great. They must be understood.

Professional implications.—It is this category of problems which probably represents the most significant departure from the apparent views of others. It is my belief that the scope of professional librarianship is potentially far greater than any presently encompassed by the prevailing concepts of it. The tools of librarianship have application in areas where people are now groping for help. There is therefore a professional responsibility to be fulfilled, but to do so will require an active effort designed to demonstrate the utility of the tools of librarianship and their specialization to particular problem areas.

To be specific: (1) The storage and retrieval of engineering documentation (not just in the sense of technical reports, but more broadly) and project data are woefully inadequate. Only the most primitive steps (such as “configuration management”) have been taken, and yet the solution of this class of problems will require the most sophisticated tools of librarianship. (2) The storage and retrieval of business data, particularly management information, is in a state of chaos in even the most advanced business organizations. The developers of “operations research” techniques for scientific management have only recently—and suddenly—come to the realization that those techniques are valueless without control of the information on which they are based. Unfortunately, the form of the information is so diffuse and the amount is so great that the unsophisticated techniques successfully used on inventory files are completely inadequate. Again, the tools of librarianship are essential to the solution. (3) The storage and retrieval of information about geographical regions, such as metropolitan areas, and related political and economical information, are essential to good government—both long-range planning and day-to-day operation. Again, the developers of “economic models” have tended to ignore their dependence upon accurate data, but more immediately have ignored the need for control of it—control which requires the type of professional knowledge librarianship provides.

These examples could be added to by the dozens. In each case, the complexity of a management, control, or research problem has made evident the need for adequate handling of the necessary information. In each case, the only tools used have been the most unsophisticated because professional knowledge was not made available. In each case, these tools have worked only so long as the needs were well structured and the size of the files small. But in each case, the needs have become more diffuse, the size of the files immense, and most important the economic restraints severe.

This represents an enormous challenge to librarianship—the

challenge to apply the tools of librarianship, with confidence that they are necessary, to a broad spectrum of information problems. To do so will require a willingness to handle a correspondingly broad spectrum of physical forms, intellectual content, and classes of users. It will require a willingness to specialize—not just in terms of subject content, but in terms of types of professional tasks.

There is, in addition to the professional responsibility already defined, a social one as well, and one which librarianship is uniquely capable of assuming. In a society as complex as ours, the control and management of information represents a powerful tool which can be put to many uses. The social problems posed by the accumulation of information, readily available, are great. The computer age itself is now only twenty years old and yet we are half way to 1984! It is important that it be viewed with social responsibility, and librarianship as a profession has demonstrated the ability to do so.

Therefore, it is my belief that a professional and social responsibility exists and that librarianship is the best suited to assume it. It will require research into the application of sophisticated library tools to a great variety of forms and types of information. It will require research into the social value of information. And it will require research into the implications—not in the technical sense, but in the social sense—of automation as applied to information files, since in large part it is automation which has raised these areas as ones of immediate significance.

Educational implications.—Recognition of the educational implications of the computer has led university after university to initiate an educational program in information science. However, the burden which library education must carry is already greater than the existing library school curriculum can easily handle. If we now add to it education in the newer methods for analyzing and solving operational problems, in the methods of system analysis, in the extension of subject matter into areas of business and government, in an increased degree of specialization in library functions, in critical social problems in the use of information, and in theoretical foundations, it is clear that a completely new look must be taken. The existing curriculum is not able, either in content or in length of time, to handle the added burden which the computer implies.

It is my suggestion that the change in library education—or perhaps better stated, the addition to library education—will come in three ways: (1) Through increased recognition of the need for specialization—in subject matter and in function—with corresponding orientation of the curriculum toward a limited set of “core courses” followed by a sequence of increasingly detailed specialty courses; (2) Through increased recognition of the need specially to educate library administrative personnel—not so much in the tools of librarianship as in the tools of good management; and (3) Through

increased recognition of the need to develop theoreticians, with broad knowledge in mathematics, logic, linguistics, economics, and engineering in addition to deep understanding of librarianship.

Modern librarianship—and its theoretical discipline, information science—has been called “inter-disciplinary” and indeed it is, but in two senses, quite different from each other. Librarianship is inter-disciplinary in the sense that it serves a great variety of disciplines—scholarly, scientific, governmental, business. In this sense, its education must be comparably multi-disciplinary; the steps between the special librarian and the subject specialist (the “information specialist”) ought to be easy ones.

On the other hand, librarianship is also inter-disciplinary in the sense that its theoretical foundations lie in a diversity of fundamental disciplines. It is this which makes clear definition of information science so important. Mathematics, logic, linguistics, economics, psychology, engineering—each has its contribution to make in developing our theoretical understanding of the processes in communicating with large files of stored information.

**Theoretical implications.**—These, of course, are the substance of information science as a theoretical discipline and, as research areas, represent the greatest long-range implication of the computer. The importance of these problems must not be under-estimated nor subordinated to the pragmatic pressures of the moment, since from their solution will come any true advancement in our abilities to handle information better.

What are these problems? In a sense, half of their solution is in their very definition, so it would be foolhardy to attempt here any but the broadest characterization. But they include problems in valuation (How do we measure information and its utility? How do we measure performance?), problems in communication (How do we process natural language so as best to represent or derive information content?), and problems in system design (How do we represent the processes, both mechanical and judgmental, in the handling of information? How do we assign them and sequence them for performing specified functions?).

In summary, the implications of the computer for librarianship are far greater and of more lasting significance than simply good management or even theoretical problems in information retrieval. They are at the heart of the profession and of the society it serves.