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Problems of Library
Automation in India[1]

IN OLD CIVILIZATIONS LIKE India and other Asian countries, libraries
have been in existence since early times. Recent political and economic
developments which have brought about various types of changes in these
countries are also reflected in the evolution of information systems.

India's educational system had a definite elitist slant in medieval
times and the legacy of feudalism during the British period nurtured this
trend. Libraries with very rich collections of manuscripts and other rare
reading material were mainly the property of the elite. The infrastructure
of the country was, moreover, not congenial for the kind of wide-ranged
library system which one can envisage today. Library development has
shown a marked change since 1947. It is estimated that India now has
approximately 90,000 libraries of different types. The Indian library sys-
tem can be divided into four broad categories: public, academic, special
and national libraries.

Public libraries: India is divided into states, union territories, dis-
tricts, subdistricts and villages. The state central libraries serve as public
libraries. There are also district central libraries, but village libraries are
few and far between. Libraries and library development are included in
the broad category of education which, under India's constitution, is
considered the responsibility of each state. Some states, namely Tamil
Nadu, Karnataka, Andhra and Maharashtra, have very progressive li-
brary legislaton which provides the necessary framework and finances for
developing good state public library systems. Despite this, only a very

small percentage of the total population of India has access to public libraries.

Academic libraries: There has been some improvement in the standards and status of university and college libraries in recent years. At present there are more than 100 universities and 8000 colleges throughout the country. Most of these have library facilities which are in different stages of evolution. School libraries, however, have not been given sufficient attention. Primary and middle-level schools rarely have library facilities, and barely 20 percent of the secondary schools have adequate library facilities.

Special libraries: These are mainly the boon of the post-independence period. Government departments, research institutions, business and industrial houses have established libraries for their own research and development programs. Currently there are approximately 1500 of these special libraries in India; they are also at different stages of development.

National libraries: Under the national library system, the National Library of India is situated in Calcutta. There are regional libraries of national stature at Bombay and Madras. Some libraries on special subjects are now being given the status of national libraries, e.g., the National Medical Library and the Indian Agricultural Research Institute Library.

The major activites of the different categories of Indian libraries are mainly routine work, such as acquisition, circulation, management, processing, reference and bibliographic service, periodical holdings, information retrieval, inventory, and so on. The services and techniques utilized in the different libraries, however, tend to make these activities very cumbersome and slow. The acquisitions of most libraries are done independently, and involve unnecessary duplication of work and lengthy procedures. Cataloging and classification methods differ from one library to another and are generally time-consuming and labor-oriented. This is very confusing for the users as they must thus switch from one classification and cataloging system to another when using more than one library. There is also a lack of bibliographic control at the national level. The Indian National Bibliography suffers from a large time lag. Almost all library activities involve long hours of manual work, tending to make library service very unpopular. Therefore, users still cannot envisage a librarian as a giver of information but consider him or her a custodian of books. In order to improve the services of libraries, application of newer methods, such as information, computer and communication technologies, will be needed. I am only concerned here with computer applications in libraries and believe that for efficient functioning of our library systems, we will need automated services at some point. But serious thought must first be given to which areas will be automated, while keeping in mind the national need.

National Scene on Library Automation

Elaborate automated library systems are still far off in the context of any developing country. The priorities of each country may vary, but the emphasis is mainly on providing the basic necessities of life to its people.

The use of computers started in India with the establishment of computer centers at the Indian Institute of Technology and the Tata Institute of Fundamental Research during 1963–64. At present, there are about 400 computers installed at different places. The size and variety range from a Honeywell 400 to the large IBM 370/155 and DEC-1077. These computers are used mainly for scientific calculations, business applications and data processing for decision-making. Computerized library activities are found in very few organizations, and consist primarily of the use of spare capacity of available computer facilities suitable for off-line use.

Although the number of institutions which have computerized library applications is still very small, the awareness of quickly and easily available information is gradually increasing. I conducted a short survey in this connection through a questionnaire and personal letters sent to different institutions and business houses outside Delhi which have automated library facilities. Like most questionnaire surveys, this one did not prove very successful, although the personal letters I received from some heads of institutions were encouraging. I then visited some of these major institutions in and around Delhi, and interviewed many of those who work with computerized systems or have plans to do so in the future. The institutions visited were: Indian National Scientific Documentation Centre (INSDOC) and National Informatics Centre, New Delhi; Bhabha Atomic Research Centre (BARC) and Tata Institute of Fundamental Research (TIFR), both in Bombay; Documentation Research Training Centre (DRTC), Hindustan Machine Tools, Ltd. (HMT) and Central Machine Tools of India (CMTI), all in Bangalore; and Small Industries Extension Training (SIET) Institute and the Administrative Staff College of India in Hyderabad. Altogether, twenty-five organizations were contacted (see appendix). While this survey may not have been comprehensive in its coverage, the extensive discussions gave a good picture of the problems facing Indian organizations using library automation.

INSDOC, New Delhi: Automation is used for indexes (authors, corporate authors and subject), a union catalog of serial publications, data processing of Indian periodicals on science and technology, directory compilation, and the centralized acquisition of periodicals for thirty laboratories. The IBM 360 model 44 and IBM 1620 are used on a rental basis.

TIFR, Bombay: Automated operations include recent additions list, cumulative classified catalog of books, weekly list of preprints/reports of TIFR, catalogs of progress serials and periodical holdings, and evalua-

tions of journals from the user's point of view. The CDC 3600/160-A and DEC-1077 computers are available in-house.

National Informatics Centre, New Delhi: Bibliographic citations are available so far only for books in its library; periodical articles are to be added. The center is a member of INSPEC tape service and a subscriber to a patent bibliographic information system since 1978. The HP 21/MX is used.

Indian Institute of Technology (IIT), Madras: In collaboration with INSDOC, IIT handled the CHEM/SDI project, a computer-based SDI system using the IBM 370 model 155 system and the CA Condensates data base. The CHEM/SDI uses a subset of CAN/SDI software made available by CISTI (Ottawa, Ontario) through Unesco for its regional pilot project. The project was also handled by NISSAT during 1976–77. The project has been upgraded into a national SDI service using CAC, INSPEC and Compendex data bases; there are more than 500 users.

DRTC, Bangalore: This group provides education and training, and researches methods for designing and developing computer-based information systems and services. A set of fourteen programs have been developed in COBOL for creation and updating of the data base, retrieval of bibliographical references in response to specific queries, provision of current awareness and SDI services, retrieval of factual data, provision of a referral service, the semiautomatic generation of a microthesaurus, indexing, and so on.

BARC, Bombay: The computer unit of the Library and Information Services of BARC uses the in-house computer Honeywell 400 and BESM 6 for information processing. Computerization activites include: preparation of a monthly current awareness bulletin, *Bibliography of Current Reports*; an SDI service offered regularly to some seventy-five users since May 1972; retrospective literature searches based on stored data on request from BARC scientists; subject bibliographies; documentation lists; compilation of periodical holdings; loan and issue system of the library; and inventory. An SDI service using the DEC-1077 computer of the National Centre for Software Development and Computing Techniques and TIFR and the magnetic tape output of the International Nuclear Information System is being developed and will be in operation shortly.

SIET, Hyderabad: This group has automated its Index to Product Profile, which is a list of literature available in the library to April 1976. A TDC 12 is used on a rental basis.

CMTI, Bangalore: Here work is being done on automating an in-depth index of periodical articles to compile a data base. They have a PDP/11 in-house. Future plans include classifying the trade catalog.

HMT, Bangalore: Currently under consideration is computerization

of the comparative product profile and the issue system. The computer used is ICL 1903.

Physical Research Laboratory, Ahmedabad: This laboratory has a mechanized catalog of its publications holdings and information retrieval facilities. They have discontinued CAS and plan to start SDI. In use is the IBM 360 model 44.

Others: Some industrial units, such as Asian Paints India, Ltd., Hindustan Zinc, Ltd., and Institute of Armament Technology have automated catalogs of holdings.

Along with all these ventures in automated library services, a week-long on-line demonstration of the ESRIN/RECON data base system used at Frascati, Italy (near Rome), was arranged at TIFR during September 1976, with the assistance of Unesco and the European Space Agency. The Frascati center had 10 data bases and provided access to about 7.5 million references at the time.

NISSAT

Although these organizations and some other institutions have plans for future automation, the most important plan in India is the National Information System for Science and Technology (NISSAT). In 1971, for the first time, it was seriously felt that a strong national network of documentation and information services was necessary to meet the ever-growing need of scientists and research scholars. The Indian government created the high-powered National Committee on Science and Technology in October 1971. A report submitted by the committee in 1973 recommended the establishment of NISSAT under the Department of Science and Technology. The NISSAT network comprises a sectoral system, a regional system and other specialized services.

Sectoral system: All major areas of science and technology are classified into information sectors based on discipline, mission and product, e.g., leather technology, machine tools, drugs and pharmaceuticals, etc. Organizations of national stature, such as INSDOC, Defense Scientific Documentation Centre, BARC and Small Enterprises Documentation Centre, will continue to provide services at the national level.

Regional system: Because of India's size, more than one sectoral center for each discipline is necessary. Therefore, regional centers will act as NISSAT contact points. These will be located in major areas of research, development, educational and industrial activities, e.g., one center is in Delhi and another in Bangalore. Similar centers will be started in Bombay, Calcutta, Madras and Kanpur.

Other specialized services: Efforts such as the experimental computer-based SDI services of IIT and the on-line demonstration of ESRIN/

RECON at TIFR fall into this category. The ESRIN/RECON demonstration was a success and attracted considerable interest, and there is now a proposal to provide permanent terminals at Bombay and Delhi.

NISSAT also includes plans to create and maintain data bases on themes of national importance, and technical and statistical data banks on such topics as minerals, resources, etc. As mentioned earlier, NISSAT is the most ambitious information network plan in India today. Although the social sciences have also been brought within its fold, its emphasis is mainly on science and technology. Therefore, social scientists are of the opinion that a parallel system for the social sciences and humanities would make the circle effectively complete.

India's library system, as described earlier, can make use of automation in different ways for more effective functioning (see Table 1). Thus far, the specialized libraries and documentation centers have laid emphasis primarily on information retrieval, which has been substantially developed in many areas. The major need for computerized bibliographical control has not yet been satisfied.

TABLE 1. POSSIBLE COMPUTERIZED ACTIVITIES
FOR DIFFERENT TYPES OF LIBRARIES

Activity	Type of library			
	Public	Academic	Special*	National
Acquisition & distribution	X	X	X	X
Management & administration	X			X
Cataloging & bibliographies	X	X		X
Periodical holdings		X	X	X
Information retrieval		X	X	
Circulation	X	X	X	

*Special libraries include documentation centers.

Problems of Library Automation

Presently, the system of computerized library activities is growing, although it is still in its infancy compared with systems in developed countries. While at the sophisticated research level there appears to be

general acceptance that computerized library activities will lead to increased efficiency, the hindrances to such a goal are many and any efforts to achieve it are the exception rather than the rule. Computerized library service is likely to be beset with technological, economic and attitudinal problems peculiar to most developing countries.

Technological Problems

Technological problems include both the hardware, i.e., the computer as an instrument for information processing, and the software, i.e., the methodology which is applied.

The major problems faced today in terms of the hardware are due to the variety of computers being used in different types of research and business institutions. The computers, manufactured by various firms (and even those of different generations of the same manufacturer), are not compatible. Developing countries sometimes receive sophisticated technology like computers as gifts from more developed countries; these often become obsolete from the manufacturer's point of view. Such machines are not only unsuitable for most complex work but any technical problems which come up cannot be repaired.

Information retrieval work requires machines more sophisticated than those manufactured indigenously, and few imported machines are capable of handling information retrieval applications. The random access facility and disks large enough for storage of bibliographic information are not readily available. In most institutions, organizational goals receive priority over the library's requirements, meaning that the librarian must use the computer available rather than what is actually required according to specifications. Library activities in all institutions are done through sharing disk space as well as computer time. Therefore, when the storage capacity is not large enough to accommodate various types of data, bibliographic data are given the lowest priority.

On-line facilities are rare in India. In fact, only TIFR's library has access to an on-line terminal for bibliographic data, the DEC-1077 computer of the National Centre for Software Development and Computing Techniques. The communication infrastructure of India is still not suitable for extensive on-line information facilities; the telephone system is not reliable enough to support an effective network facility.

Software problems arise because programs must be developed in terms of the machine on which they are to operate. Therefore, the incompatibility of equipment tends to make the software incompatible as well, especially when programs are written in machine or assembly language. While using languages which are not machine-bound, such as FORTRAN, COBOL, ALGOL, etc., may seem like a solution, in actual

practice such languages cannot be interchanged without suitable modifications. A software package developed for the IBM 360 model 30 would require many changes not only in the program but also in the programming language if it were to run on any other computer. Development of a program suitable for the available machine is therefore preferable to acceptance of a package program. This makes the development and use of package programs difficult and leads to a lack of standardization in programming language as well as in output.

Machine-readable data bases are byproducts of international information network systems and are available on magnetic tapes. These are useful in building information resources and for retrospective search and current awareness services. Again, however, the tape service is expensive and suitably sophisticated computers are scarce. The data bases have a standard format which requires extensive changes to fit existing hardware and other system requirements. Also, relevant bibliographic information has to be selected from the data base and stored. Often this storage space is scarce and expensive.

Economic Problems

The major obstacle for any innovations in developing countries is the lack of resources. The initial cost of establishing a computer system is beyond the reach of most organizations and institutions. Library and information processing is done either with spare computer capacity made available by the institution itself (providing there is an in-house computer), or with computer time hired from another institution. The cost of hiring computer time and storage space is very high and often cannot be justified at the management level by cost-benefit analysis. At IIT, for example, CPU time per hour costs Rs.1000 for educational purposes and Rs.2000 for business and industrial use. Moreover, the computer provides only paper printout, and the paper often costs more than the processing (which runs approximately Rs.15/- per thousand lines). Few developing countries can afford the machine-readable data bases, either. The tapes are very expensive and because foreign exchange is involved in subscribing to them, it is even more difficult for most organizations in India and other developing countries to afford them. The annual subscription rate of one data base is now $8000.

Library tasks often overlap and their peculiar nature seldom makes the advantages of computerization seem very convincing in the light of cost-benefit analysis. In India, libraries and information centers are attached to government organizations or research institutions, so library services cannot be calculated on a profit/loss basis. Long-term benefits have to be kept in mind while justifying such services.

The libraries that have computerized some of their services or operations often have not taken such steps as a result of serious thought. Computerization has a glamour of its own in the minds of many librarians. Overly enthusiastic librarians often run uneconomical programs, producing lengthy listings, for instance, in the name of computerized service. Often the manual method is used concurrently with the computerized system because of a lack of faith on the part of staff and users. The duplication of work and the cost involved in these cases is obviously unjustifiable; the librarian should know which aspects of service should be mechanized. An example of an economically viable computerized library activity is the centralized acquisition of periodicals in operation at INSDOC. This facility serves thirty laboratories, which not only frees the facilities from the tedious task of periodical acquisitions but also eliminates the cost of duplicate purchasing.

Attitudinal Problems

Computers appear very awesome to developing countries. They are powerful machines which can perform many functions and therefore offer a solution to the many types of manual inefficiency which often plague the developing countries.

Among librarians there are two different attitudes toward computerized facilities. One group is taken in by the glamour of modern technology and believes that computers can perform miracles. Members of this group often give insufficient thought to the real value of the computer to the organization/institution and make uneconomical, haphazard use of the facility. The other group, still the majority in developing countries, lacks knowledge of the potential and consequences of library automation. There is constant tension between this traditional librarian group and the "new-wave" librarians. Professionals of the majority group do not realize that computers cannot replace human intelligence. Due to the accuracy essential for data input in library services, the librarian/information scientist is indispensable. The National Library of Calcutta conducted an experiment to computerize the Indian National Bibliography in 1968. The scheme failed, however, because labor unions opposed it fearing retrenchment of library staff. Among developing countries, the attitudes of India's librarians are typical. They are not confident about automated services. Library staffs should therefore be trained in programming and thus be made aware of the work involved in automation. They will then realize that automation will not take away their jobs. They will also realize that computers are machines which have their limitations as well as their advantages.

The communication gap between the librarian and the computer

specialist is another major hindrance in establishing any effective auto-mated system in a library. There is often disagreement among the librar-ian, the programmer and the systems analyst. Librarians should be trained in computer programming and computer specialists should be versed in the special needs of library automation. Only then can a com-mon language evolve among the three and a project be started.

Administrative personnel assume a very important role in decision-making. Their enthusiasm, support and conviction can help realize any new plan, just as their apathy and lack of understanding of the need for accurate and speedy information can jeopardize any effort. Although many things have taken a favorable turn in India, the majority of those at the management level unfortunately are not conversant with the develop-ment of information science and are unaware of the important role of information in all areas of national development. This very often results in insufficient planning, which in turn curbs the enthusiasm of imaginative information scientists and librarians. Due to this lack of appreciation, priorities are poorly ordered and funds are not well allocated. Adminis-trators also have a tendency to underestimate or overestimate the capac-ity of automation.

Any information system or service is planned for the best possible benefit to its users. Unless the users are mentally prepared to accept a new system, however, it cannot be effective. Indian users are still un-familiar and overawed by computers, so computer awareness and in-terest has to be fostered to enable proper utilizaton of a system. They should neither overestimate computer capabilities nor be afriad of inter-acting with the computer systems. Another obstacle is that, because batch processing systems are still in use in India, there are bulky printouts in monotonous type faces and formats which prove to be a headache not only for the librarian, but also for the user.

There is no dearth of manpower in systems analysis and computer programming in India. We are already exporting software packages to countries that find them less expensive than developing their own. Li-brary automation is still neglected, however; it is an area which has not attracted young people with appropriate expertise.

Training should be given to both the librarian and the computer spe-cialist about each other's functions and possibilities. Both INSDOC and DRTC conduct courses on automated systems in libraries. Under the forthcoming NISSAT plan, steps are being taken to build the requisite technical manpower. Moreover, the Indian government's Department of Electronics is developing training programs for the National Informatics Centre. There are two main objectives in training for library automation: (1) to orient the programmers and system analysts to writing programs

suitable for automating library facilities, and (2) to persuade librarians to accept the utility of automation and teach them to prepare accurate inputs to make the system worthwhile.

Recommended Improvements

1. The computers used in India should not vary so widely. Production of computers with special capacity for library automation should be taken into consideration.
2. Government policy has taken a positive step in establishing large computer systems, with one sophisticated central computer capable of handling complex information to be connected to indigenous mini-computers. The National Informatics Centre project dealing with agricultural and other governmental data processing is designed along similar lines. Such plans should be pursued.
3. Indigenous, inexpensive library package programs are very necessary. These should be usable on a large variety of machines and be capable of handling different activities in the library. The MARC format would be ideal if it could be adapted for the smaller indigenous computers. DRTC is currently involved in preparing software packages for information retrieval.
4. The international data bases are being used by some organizations. However, these are expensive and often not applicable to Indian research needs. Indigenous data bases with our specific requirements should be prepared. Core periodicals in each subject relevant to India, and literature from important Indian periodicals, should be used as input for such data bases.
5. A national standard or common language for bibliographic information exchange is necessary. Efforts are being made to achieve a standard language compatible with any international standard.
6. Training of personnel, i.e., proper communication among the librarian, computer programmer and systems analyst is very important. Courses offering training in library automation are being taught, but there is a general need for better understanding among these three architects of library automation.
7. User awareness and orientation is very much needed. The users comprise managerial policy-makers as well as the research scholars and regular clientele of a library. The need for, as well as the possibilities of, automated library facilities have to be highlighted by professionals and experts in this area. A few seminars and workshops have been conducted at New Delhi and Bangalore, namely the UNISIST workshop in August 1975 and the Indo-U.S. seminar in 1977; however, little else has been accomplished in this area.

Conclusion

Do we need library automation now? In developing countries the problems are many and though they are not insurmountable, they are certainly very difficult to face and live with. The most pertinent question for our profession in this regard, however, is whether we really need computerized library services on a large scale.

A colleague from Bangladesh said: "The library and information sciences are a 'least-priority area' in this country. Only 20 percent of the people can write their names. There is an acute shortage of readers. . . . Most of the nation's resources are utilized for food, shelter, flood control and health problems." Although the Indian situation differs from that of Bangladesh in many ways, the first priority of any developing country is to provide the basic necessities to its people. Literacy and education are still at the primary level. Information of a very basic nature, such as the essentials for healthful living, must be presented in simple terms and communicated through media which will reach the people. Library activities of even the most primitive nature will not be within the intellectual grasp of most people unless the library is turned into a proper communication center. We cannot take as our model the community information center as developed in the West. The economic and social problems here are so acute and diverse that no one model for all parts of the country can be established.

As discussed earlier, library facilities may have to cater to a sophisticated and highly academic clientele in different organizations even though it is a minority. Libraries have had a long tradition here, but academia has yet to develop a tradition of data-oriented search for knowledge. The concept of libraries as storehouses of books remains very strong. Information is still sought in books rather than in microform. Because profundity in knowledge is the tradition of Eastern culture, the modern trend toward fast, accurate information is still not expected. That is exactly what a computer is supposed to provide for a scholar. Information is often treated as a commodity in the West. In industrially developed countries it is believed that any information which is economically profitable should be considered worthwhile and made quickly available. Can the same be said of the Indian situation? In highly developed industries, such as Hindustan Machine Tools, Ltd., a survey of the information needs of engineers revealed that the time factor was not important. Even if the information were received a day or two after it had been requested it would still be accepted and used. The competition in the industrial field is not sufficiently keen to require immediate information. Industrial research is done in a relatively leisurely fashion in India. At the documenta-

tion center of SIET, the need for computerizing library and information work has not been perceived. I quote: "As of today, there does not seem to be adequate justification for computerizing library and information work here. Our intake is not that sizable, nor are the demands on us yet so enormous that we should think of using computers."

The genuine need of the country is to provide usable resources for spreading literacy and to develop libraries at the school and college levels in order to give students the opportunity to acquire the taste for information. I do not intend to belittle the efforts to build a sophisticated information system such as NISSAT. India is a country in which the levels of development are varied in different areas. Its planners must therefore cater to the needs of each area in its own right. On the whole, however, our priorities still differ. Both librarians and clientele must be made information-conscious before anything as expensive, sophisticated and dumb as a computer can become a tool in their hands.

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APPENDIX

1. Administrative Staff College of India, Hyderabad
2. Asian Paints India, Ltd., Bombay
3. Bhabha Atomic Research Centre, Bombay
4. Bharat Heavy Plate and Vessels, Visakhapatnam
5. Botanical Survey of India, Allahabad
6. Central Machine Tools of India, Bangalore
7. Centre for Development Studies Library, Trivandrum
8. Computer Society of India, Bombay
9. Documentation Research Training Centre, Bangalore
10. Gokhale Institute of Politics and Economics Library, Poona
11. Hindustan Machine Tools, Ltd., Bangalore
12. Hindustan Zinc, Ltd., Udaipur
13. Indian Institute of Technology, Madras
14. Indian National Scientific Documentation Centre, New Delhi
15. Institute of Armament Technology, Poona
16. International Institute of Population Studies, Bombay
17. Metallurgical and Engineering Consultants (India), Ltd., Ranchi
18. Mysore University Library, Mysore
19. National Informatics Centre, New Delhi
20. National Rayon Corporation, Ltd., Thana District, Maharashtra
21. National Sugar Institute, Kanpur
22. Osmania University Library, Hyderabad
23. Physical Research Laboratory, Ahmedabad
24. Tata Institute of Fundamental Research, Bombay
25. Small Industries Extension Training Institute, Hyderabad