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LIBRARY AUTOMATION AND NETWORKING IN INDIA - AN OVERVIEW OF RECENT DEVELOPMENTS

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INTRODUCTION

This paper presents an overview of recent developments in library automation and networking in India and raises issues believed to be of basic nature as a contribution to the on-going debate and discussion on the subject in the country.

LIBRARY AUTOMATION IN INDIA - THE LAST 10 YEARS

The main players in the area of library automation in recent years have been special libraries of the country. These libraries/documentation centres are in the R&D institutions under the Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR) and the Defence Research and Development Organization (DRDO). Notably, libraries belonging to the private sector and public sector industrial R&D organizations such as BHEL and Steel Authority of India Limited (SAIL) and international organizations such as International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have also made useful contributions. In fact such libraries have provided the leadership and have become training grounds for other libraries.

Considerable impetus to the use of new information technologies in special libraries has been provided by the support that the Department of Scientific and Industrial Research (DSIR) has extended to the Sectoral Information Centres established in some of the CSIR laboratories under the auspices of the National Information System for Science and Technology (NISSAT). NISSAT has also funded several training programmes and software development projects which have played an important role in improving awareness of new technologies and their potential, and in transfer of skills and software to different special libraries in the country. Understandably, the emphasis in most of the special libraries has been on database development and information retrieval services.

With the exception of a few university libraries such as those of IIT Kanpur and Hyderabad University, the university sector has not been very active. Unlike the UK or US, academic libraries in India are not in the forefront of developments and innovations in the application of new information technologies.

Furthermore, there is no evidence of any activity, nor of any planning for the introduction of new technologies in the Indian public library system.

Several factors have favoured the adoption of new technologies in special libraries. Most of them are in publicly funded organizations and they function relatively autonomously and so decision making is easier. Secondly, special libraries are under pressure to deliver more efficient services and to provide better and wider access to information. Thirdly, The wide availability of personal computers has undoubtedly contributed to special libraries being able to automate their functions and to build specialized databases. One factor that has probably made the greatest contribution to automation in special libraries in India is the free availability of Unesco's Micro CDS/ISIS and the relative ease with which a specialized databases can be developed.

Unlike special libraries, academic libraries in India function in a relatively less autonomous environment; They have to compete for scarce resources; They are by comparison small units within a large organization; Undergraduate students outnumber the graduate students and the faculty and research staff; and as a pressure group, undergraduate students do not have a great stake in

improved library services. In general, these libraries do not seem to be under pressure to improve their services as much as are the special libraries.

However, the University Grants Commission (UGC) in 1989 took the initiative to plan for a country-wide academic library and information network called INFLIBNET, and this is referred to later in this paper. This initiative has the potential to make a significant impact on operational efficiencies and user services in libraries in general and academic libraries in particular.

LIBRARY AUTOMATION SOFTWARE

In the last few years, there have been some important and useful initiatives in the development of library automation software. Some special libraries notably at BHEL R&D [4], SAIL, ICRISAT [2], INSDOC, NIC, Defence Scientific Information and Documentation Centre (DE-SIDOC), IIT Kanpur, etc. have successfully developed software for library automation. Understandably these centres have concentrated on developing applications which are important in their specific environments, and where they pay off in terms of better control, new services, or more efficient operations. Book and serial acquisition, computer assisted cataloguing, union catalogue production, SDI, and current-awareness are some of the areas where applications are developed.

In addition to the efforts at the above mentioned centres, CMC Ltd., a public sector computer company has built an integrated software package called MAITRAYEE suitable for a library network [4]. This package will be applied in CALIB-NET, a network of libraries in Calcutta. It is yet to be observed how the package will be received and used.

More recently, DESIDOC [3] has built an integrated application using Micro CDS/ISIS which is a major contribution in enabling small libraries in the country to realise the benefits of automation. More over, the use of public-domain software like CDS/ISIS and common standards for database creation, bibliographic description, indexing and classification, etc. act as a catalyst to improve sharing of resources among libraries in India. This requirement is becoming more and more important in view of the erosion in the purchasing power of libraries and fall in the value of the rupee

vis-a-vis hard currencies.

CDS/ISIS is also used for the development of other utilities. One such example is the development at ICRISAT [5] of a general purpose program for the production of SDI outputs based on stored

Commercial Software

Significantly, in the last few years there has been tremendous development of commercially available software for library automation. LIBSYS [7], and TULIPS - among the better known commercial packages - are available for use on micro-computers, minicomputers and mainframes, and in LAN environments. One measure of the maturity of these packages is that they are written as applications under well known Database Management System (DBMS) packages, e.g., Oracle, Ingres, etc. Most of them are offered as integrated library management packages. There is now considerable experience in their use, which has enabled developers to enhance their first offerings.

There are some differences between the features of these packages and those of the GEAC or VTLS which are developed in the west. Firstly, none of the Indian packages, with the exception of the MAITRAYEE, fully support machine-readable catalog (MARC) records. It may not, currently, be significant in India, but it will definitely be of significant importance when the large libraries, such as universities libraries, begin to retrospectively convert their catalogues into machine-readable form. The need to access MARC records on CD-ROM or other media and to restructure such records for use in local systems will undoubtedly become apparent. Similarly, the need to prepare for co-operative and shared cataloguing of Indian publications and for accessing current cataloguing information on external networks will make it essential for locally or commercially developed software to be capable of using MARC records. Secondly, Indian packages have attempted to offer more than library automation. For instance, they have attempted also to be information retrieval systems. Some of the systems also allow entry of information on serial articles, chapters from books and other analytics. They also provide SDI capabilities. Such a facility on the face of it is good but the packages in question may not always adhere to the internationally accepted standards for such types of documents. also, it is naive to think that

libraries, however large they may be, will, on their own, be ble to provide comprehensive information retrieval and dissemination services relating to world-wide periodical and specialized literature. Access to external databases and information retrieval systems would still be required. It would be interesting to find out to what extent the information retrieval capabilities of commercially available Indian packages are in fact being used.

Thirdly, the packages in the west are increasingly emphasizing the incorporation of end-user friendly interfaces, and the provision of on-line public access catalogues (OPACs). Indian packages, however, are still oriented mainly to be used by librarians and information specialists and not by the occasional end-user student, teacher, researcher, etc. However, the question of OPACs in India at the moment is an academic one since the computing power and telecommunications facilities required to provide OPACs is considerable and not yet available to the libraries in India.

Considerable research is continuing in the US and UK on the design of friendly interfaces including the use of artificial intelligence and graphical user interfaces (GUI). Developers of library automation software in India will hopefully take note of such developments in their software development work.

Relevance of Integrated Library Systems in India

Integrated systems in the west recognize the centrality of the cataloguing record in library operations. Automation of acquisition, cataloguing, circulation, reference and information retrieval functions are dependent on the capture of cataloguing records and access to them. The information infrastructure of the west is built to ensure that the libraries of all types have wide and easy access to the cataloguing data.

Data networks ensure that access to such data is reliable and cheap. The MARC record produced not only by the national library but also cooperatively by several others is the kingpin in the whole process. Libraries in the west have a long history and tradition of centralized, cooperative and shared cataloguing, and adherence to common standards in classification, cataloguing and indexing. Professional manpower is expensive and the larger libraries in the west have dedicated minicomputers or mainframes for library automation. Smaller

libraries including special libraries have access to computing power and the auxiliary special libraries have access to computing power as well as to auxiliary storage capacity either on mainframes of their parent bodies, or on their own PC-based local area network (LAN).

Integrated library management software in the west is designed to take full advantage of this infrastructure, and the emphasis in a library that acquires and uses an integrated software package is firstly, on the cost-effectiveness with which a publication can be acquired, processed and made accessible to users including access on an OPAC, and secondly, on the speed with which both the bibliographic record and document can be shared by other libraries.

In India, on the other hand, key elements of the infrastructure that make for the effective application of an integrated library management software package are missing. For instance the library utilities like an Indian MARC which the libraries can subscribe to or access on-line to obtain cataloguing data on Indian publications including those in Indian languages, are not available. Thirdly, unlike in the west few libraries can afford to own mainframes or minicomputers dedicated to library automation. Libraries in India simply do not have a culture of shared and cooperative cataloguing. In short, the objectives of using integrated library management software packages in India at the moment are not the same as those in the west. Within-the-library also, integration of functions is not often possible because the different functional units of a library - acquisition, cataloguing, reference, circulation - normally do not have concurrent on-line access to the databases and authority files that constitute an integrated application. Such access is possible only if a library has several terminals to a mainframe or minicomputer or has a dedicated LAN of its own. Even where a library has access to a mainframe or minicomputer (e.g. in the universities' R&D Institution), the disk space that is available for library applications is simply inadequate for a proper integrated application. This is because the library has to compete with other departments for limited computing and related resources. Only when libraries improve the quality and efficiency of their services will their bargaining power for more resources improve. It appears that libraries in India will do well to concentrate on tasks that have a direct bearing on user services rather than

on increased operational efficiency. If this be so, should libraries invest in costly integrated library management software? Is there a role for special purpose software with a clear perspective for integration at a later date when other elements that make for effective integration become available? For instance, is it an accident that university libraries in the west automated their circulation systems before they thought of automating their cataloguing or acquisition systems?

As in the manufacturing industry, so in the information industry, the capital expenditure on building the appropriate infrastructure in a developing country generally falls to the government of the country. This infrastructure in the form of better communication networks, facilities for database development, easier access to hardware and software, etc., is now slowly being built in India.

The recent liberalization of India's investment and economic policies will no doubt provide a further impetus for private sector investment in information technology and its applications.

Effective utilization of this infrastructure is the responsibility of individual libraries of all types. This means that libraries in India should give the highest priority to improving their services and ensuring easier and wider access to documents and information for their users. The only way libraries in India can cope up with the rising costs of informational material and increased demands from users is by better coordination, cooperation and sharing of resources with libraries having similar interests. The networking of libraries and the application of new technologies for this must get high priority. A vital pre-requisite for networking is agreement and conformity to common standards for library processes. Furthermore, there is need for a greater committnent to the sharing of bibliographic records as well as the documents and their copies. India has not been very good in sharing of resources. This is partly due to the lack of initiatives on the part of librarians and partly due to the lack of policy support to encourage libraries to share their resources with others. Technology alone cannot help bring about the required changes. Attitudes, practices and policies need to change if libraries in India are to truly benefit themselves and their community of users by the application of new technologies.

The questions arise now : Is the western model of

library automation and networking relevant to India in its present state of development?, If so, to what extent?, What are Indian professionals doing to make the benefits of automation and the application of new technologies flow not only to libraries but also to the users of all kinds?, How can other technologies (e.g. optical disks) be used to further the goals of better service? What roles should the national libraries, professional bodies and the schools of library science play in ensuring effective use of new technologies?, How are the decisions on building of the information infrastructure being influenced and implemented? Is there a role for the publishing industry and the book selling trade?, etc.

LIBRARY AND INFORMATION NETWORKING IN INDIA

A distinction is made here between infrastructural networks and application networks. The former are those that provide the hardware, software, protocols, and freeways for the free flow of information. Application networks are those which are set up by or for a specific community (librarians, bankers, etc.) or for a specific community using the infrastructure to serve well defined end-users. In the last few years, there has been considerable thinking and investment in the development of infrastructural networks.

INFRASTRUCTURAL NETWORKS

Public Packet-Switched Data Network

The Department of Telecommunications has established this year (1992), a nation-wide public packet-switched data network (PSDN) called I-NET which will have nodes in 8 cities connected through high speed (9600 and 64000 bits per second) links. I-NET supports CCITT standard protocols/interfaces : X.3, X.28, X.29, X.25 and X.75. It is accessible using dedicated or leased lines for asynchronous (X.28) or synchronous (X.25) connection with standard modems/drivers. I-NET is ideal for users whose data traffic does not justify a dedicated network. Databases when mounted on I-NET hosts are of great interest to the library community. Electronic mail is also possible on I-NET. Further, it also provides international connectivity to important data networks outside the country through the GPSS (Gateway Packet Switched Services) of the Videsh Sanchar Nigam Limited (VSNL), India's overseas

communication services at Bombay, Madras and Delhi. PADS (Packet Assemblers/Dis-assemblers) at these cities ensure access at 300-2400 bps to the gateway and to external networks.

I-NET and the GPSS have ushered in an era of relatively inexpensive and reliable computer communications in India and it is now up to the library and academic community to take advantage of these facilities. Library networks using a combination of dedicated lines and dial-up access connections using the infrastructure of I-NET are a distinct possibility and one can look to the future of library networking in India with hope.

NICNET : A unique infrastructural network with a history that goes back to 1970's is the National Informatics Center's (NIC) network called NICNET. It is unique in the sense that it uses almost exclusively, satellite-based communications using low cost roof-top micro-earth stations to connect 450 district headquarters and 32 state and union territory capitals with a central hub at Delhi. Another unique feature of NICNET is that it uses 500 very small aperture terminals (VSATs), each of which is connected to a specific outbound and inbound channel on the satellite's transponder. Data transmitted by a VSAT is received and relayed via the satellite (INSAT 1D) to another VSAT, all of which are addressable. Both individual and group addressing of VSATs is possible. VSATs have been used to connect computers, terminals, telexes or other devices to each other via the satellite. With this technology, it is possible even for remote corners of the country to be connected without recourse to telephone lines, multiplexers, modems, etc.

NICNET has large mainframes at four cities in the country with supermini computers at the state capitals and union territories, all linked via the VSATs and satellite.

NICNET is designed primarily to be a government information network. Its objectives are to promote the collection, storage, analysis, transmission, and exchange of data at districts, state headquarters and central ministries and departments at New Delhi for use in planning, management, and monitoring of projects and government sponsored programmes. It has been used extensively during the emergencies caused by natural calamities and to obtain help and information in health and agriculture related areas.

Although NICNET is principally meant for use by the Government departments, it does have the potential for use by the library and information community. It is possible to mount databases on one or more of the mainframes of NICNET for online access by users in government departments, research institutions supported by the state or central government etc. The Indian MEDLARS Centre (IMC) of the NIC has mounted the MEDLINE database on one of NIC's minicomputers at Delhi and this is remotely searchable using dial-up access from NICNET terminals throughout India. In addition to the MEDLINE database, IMC provides dial-up access to CD-ROM databases of the US National Library of Medicine, and to Biological Abstracts and the Science Citation Index.

An example of how NICNET has been used to mount an application network is seen in the Biotechnology Information System (BITS) of the country. This network initiated in 1986 under the auspices of the Department of Biotechnology of the Government of India, operates through nine centres known as Distributed Information Centres (DICs), affiliated to University Departments or research centres under the CSIR or ICMR and specializing in an area of biotechnology. The DICs are charged with the responsibility of developing bibliographic and nonbibliographic databases in their areas of specialization and to provide computer-based access to users of such information in the country. Further, the DICs are expected to provide access to biotechnology information elsewhere in the world through collaborative and cooperative programmes including the exchange of data, databases, and mutual access to such information. Each of the DICs is a NICNET node and hence all the DICs are interconnected for mutual access to databases and have the facility of E-Mail. Further, each of the DICs may possess specialized databases on CD-ROM which can be remotely searched throughout the country. The DICs also provide access to specialized software useful in biotechnology research and development. Since NICNET was designed primarily for government use, the extent to which it will be available for library networking and for access to public databases is not yet clear. Once traffic on NICNET becomes heavy, it may not be able to service the library community and information users among the general public as effectively as one would desire. NICNET will, however, keep abreast of new technologies in satellite-based communication and therefore the

library community in the governmental sector should stake its claim to use NICNET wherever possible.

INDONET : INDONET is a commercial distributed computer network to provide access to the considerable computing and software resources of CMC Ltd., a public sector company in India. The objective is to provide computing power and software to users who cannot afford or fully justify investment in dedicated hardware and expensive, specialized business and scientific software. INDONET has three IBM mainframes at Calcutta, Bombay and Madras and smaller computers at Delhi and Hyderabad. The network uses dedicated lines operating at 2400 to 4800 bps. It has plans to use roof-top antennas and packet-switching for data routing within the nodes of the network. Intra-city access to INDONET computers via line-of-sight pocket radio is also being investigated. The Bombay node of INDONET is connected to VSNL's GPSS enabling computer-to-computer communications via networks abroad. INDONET also has plans to mount public databases on one or more of its computers. However, the costs of using INDONET will probably preclude its use by the library and information community to any appreciable degree, especially since cheaper alternatives have become available.

APPLICATION NETWORKS

In the last three or four years there have been considerable activity for planning and building of library and information networks. Three major efforts to network libraries in the country are briefly described below. An attempt has also been made to raise questions believed to be important for the future of library networking in India.

INFLIBNET : INFLIBNET [8] is envisaged as a computer-communications network linking libraries in universities and colleges in the country and libraries in institutions affiliated to the CSIR, ICMR, ICAR, DRDO, and Government departments. When full fledged, it is envisaged that INFLIBNET will network 184 universities and 23 institutions deemed to be universities, 6100 colleges and over 200 libraries affiliated to other organizations.

INFLIBNET is being planned as a multi-service network and will provide catalogue-based services, access to databases and document supply

services, and facilities for computer mediated communications such as E-Mail, conferencing, bulletin board, etc.

INFLIBNET is designed to operate at four different levels, viz., national, regional, sectoral and local. The National centre will coordinate the activities and services of the network and provide the policy frame. Regional centres in the north, east, west and south of the country will be established in designated university libraries in different regions. These will maintain regional union catalogues. Sectoral centres will be at specialized institutions, e.g. CSIR laboratories. The sectoral centres will create and maintain databases in specific disciplines or missions. End-users will be serviced at the local level, i.e. colleges, R&D centres, university libraries, etc. About 400 local nodes are proposed to be set-up initially. In addition, INFLIBNET proposes the establishment of 100 document resource centres in different universities and R&D centres. These centres will be the focal points in a country-wide document delivery service.

The network will use both satellite-based and terrestrial communication channels for connectivity. The system will have 400 ground terminals at 150 university libraries, 50 autonomous colleges and 200 other centres. Intra-city links will be provided via local area networks.

INFLIBNET is expected to evolve standards based on national and international practices for uniform adoption throughout the network.

INFLIBNET as conceived is undoubtedly a bold initiative that the UGC has taken. The magnitude of the effort envisaged can be seen by the expenditures that are estimated. A capital expenditure of Rs.1030 million and a recurring annual expenditure of Rs. 477 million is the estimated need. Further, it is envisaged that the whole expenditure on capital goods and services required and working capital will be provided by the Central Government.

It is vitally important for the future of library and information networking in India that INFLIBNET succeeds in its mission to improve interactions among academic and research libraries in the country for the efficient and effective sharing of resources, databases, information, document delivery and other services for the benefit of the

library, student, teaching, and research communities in the country as a whole.

However, there has not been enough debate and discussion about the conceptual and physical design features of INFLIBNET among its important stake holders, viz., the library community of the country. The following comments and observations are offered as a contribution to the discussion from the perspective of this author.

INFLIBNET has followed a typically top-down approach to network planning. A few specialists comprising senior librarians, systems analysts, administrators and telematics professionals met in Delhi over a period of three months in 1988 to formulate the INFLIBNET plan. Such an approach could not have taken into detailed account the ground realities in a large country such as India. However, given the need to make a quick headway into networking, a top-down approach was probably the best way to make an initial plan, which at best can be thought of as a macro-plan. Refinement of the plan and its implementation, however, would need to take into account the realities of the situation in different parts of the country. More importantly, commitment to the plan not only from the librarians but also from the top managements of the different institutions to be involved in the network needs to be obtained. Unfortunately, there does not seem to have been any attempt at micro-planning required at the different institutions so that they could in turn take up suitable activities within their own organizations. Also, although the plan is more than three years old, not much has been done to build awareness among librarians and to get their input into ways of implementing different components of the network. As of now, university and other librarians do not seem to be clear about their roles and the kinds of investments in equipment and software, training and staff skills they would need in order to become full-fledged participants of the network.

Another problem with INFLIBNET is its ambitiousness. The investments envisaged seem to be far more than what the University Grants Commission (UGC) or Government of India can provide during the Eighth five-year plan. This has apparently necessitated rethinking on the outlined activity plans. The sheer size of the plan and the ability/willingness of the Government to commit resources needed, lead one to ask if it would not have been

wiser to start on a smaller scale and build incrementally in the interest of the sustainability of the whole project and providing proof of the workability of ideas and methods envisaged in the plan.

It is probably pertinent at this stage to look at the experience of the United States in library networking. Butler [10] writing as far back as 1975 on the state of networking in the US identified three factors that aid or hinder library network development. The factors listed below were seen to be predominant in the success of the networks in the US.

a.   A Network's development time in planning is inversely proportional to the number of skilled, experienced library planners involved the minimum number which is two.

b.   Network development is inversely proportional to the time required to produce the first network product, i.e., the longer the network group is required to support development without production of a valuable output, the less likely it is that the network will survive.

c.   Network development is directly proportional to the level of funding and centralized administrative management. That is, money is significant, and there must be a strong central administration - which means decision making power and management which includes planning, development, and marketing the network's functions.

As it is presently conceived, INFLIBNET combines in itself both the functions of a library utility (e.g. Online Computer Library Center) and that of a consortium of libraries (e.g. Southern Libraries Network). Some members of the network will probably have to provide utility services (e.g. production of catalogue cards for members) in addition to serving their local clientele. This could lead to inefficiencies on both fronts due to equipment, staff or managerial difficulties. An alternative would have been to set up a commercial or quasi-commercial agency which would specialize in providing utility-based services. This would leave libraries to concentrate on their main functions, viz., acquiring and processing documents, servicing the users and more importantly to engage in cooperative acquisitions, resource

sharing within the consortium. Such an approach would help strengthen links that already exist between libraries of a region or sub-region or discipline, and the more successful of these would be models for other consortia. Coordinating a well defined group of libraries with shared interests is probably more feasible and manageable than coordinating a heterogeneous group of libraries.

INFLIBNET envisages a hierarchical model for the computer-based communication paths in the network. For instance, a college library will be linked to the university library which in turn will be linked to the Regional Centre and Sectoral Information Centres. The possibility of multilateral communication, the essence of computer-based networks, is possible but only via the central hub in New Delhi, since the whole network is envisaged as a star configuration, except in the large cities where libraries are to be linked by a terrestrial local area network. As it is presently conceived, it appears that multilateral communication in most cases will be only for message transfer and not for database access. Such an approach would probably be adequate to begin with but as more and more libraries become computer-proficient, libraries will begin to look for more autonomy in computer use, database development and access to external databases. Such a phenomenon in fact has occurred in the west and this is well described by Hildreth [10, 11]. It is important to consider how we might cope with such a situation.

DELNET : DELNET is one of the two experiments that is now on-going in the country to network libraries in big metropolitan cities. These experiments may provide guidelines for the city-wide sub-networks envisaged in the INFLIBNET project.

DELNET will network 35 libraries in Delhi area [12]. A packet-switched network is envisaged with each cluster of libraries being serviced by a packet-switching exchange. Participating libraries have begun creating databases of their monograph and serials holdings using CDS/ISIS. Records are in conformity with the Common Communications Format (CCF). A union catalogue of serials has been created and is available at one of the libraries in the network. All databases created co-operatively are expected to reside on a central computer system and dial-up access will be provided to all participating libraries. In addi-

tion, the network will have E-Mail, file transfer and bulletin board facilities.

CALIBNET : CALIBNET will network 38 science and technology libraries in the Calcutta Metropolitan area. The plan is for the introduction of automated systems in the participating libraries before networking them. Each of the libraries is expected to automate their book acquisitions, cataloguing, serials control, fund accounting, and circulation control. It is not clear, however, if all the libraries will use the same software package, viz. MAITRAYEE. The network centre will provide on-line access to the network's union catalogues and current-awareness services including SDI. As with DELNET, each cluster of libraries will be serviced by a packet-switching exchange.

Libraries participating in CALIBNET will use AACR-2 for bibliographic description. The software, MAITRAYEE supports MARC records and will also enable records to be imported/exported via the CCF format. CALIBNET will be linked to DELNET via dial-up access and to external networks via the GPSS.

Both DELNET and CALIBNET are in the initial stages of development and the experience gained by the libraries and software developers in these two networks will undoubtedly be very valuable in similar work that will be taken up elsewhere in the country.

CONCLUSION

A review of the kind attempted here cannot capture the buoyancy and enthusiasm that is evident today among librarians in the country. There is a distinct sense of urgency and an eagerness to get things done. There have been impressive gains in the skill-base of the library profession. More and more professionals today, compared to even three or five years ago, are becoming not only computer-literate but quite proficient in systems analysis, programming, and the application of new tools and techniques for library management, and information retrieval. There is today a greater appreciation among library professionals of what the new technologies can and cannot do. Librarians who were once extremely wary of computers are today willing to burn their fingers. All this can only augur well, and give hope of steady progress in the challenge of utilizing new technologies for better access to knowledge and

information in the country's thrust towards greater academic, economic and social progress.

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