

IMPACT OF INFORMATION TECHNOLOGY (COMPUTERS) ON BIOMEDICAL INFORMATION CENTRES AND LIBRARIES (ICLs) IN INDIA : A CRITICAL EVALUATION

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Biomedical information is critical to public health in general, and biomedical research and education in particular. Although some progress has been made to improve the biomedical information centres and libraries (ICLs) in India with the help of information technology (IT), there remain ICLs where concept of modern IT does not exist. Deals with the computer aspect in information technology. Furthermore, aims at developing a model of Indian Biomedical Information System using computer technology, its relationship with ICLs, users and professionals. Identifies Government of India (GOI) policies and programmes to promote and design IT based services. The study deals with seven objectives. Keeping these as main objectives, the research plan was drawn and multi-method approach employing field survey random sampling method and questionnaires as main instrument was adopted. However, interviews and indirect studies of records were adopted for collection and analysis of relevant data to supplement the data collected through questionnaires, so as to enhance, strengthen its reliability and gather some additional information on specific aspect of computer and ICLs, which were not obtained through questionnaires and literature searches. The conclusions speak of the future environment for biomedical librarians/information scientists/information consultants, as existing services, resources provided to biomedical community are inadequate and insufficient to meet their demands.

INTRODUCTION

As a result of innovations in technology, many new interdisciplinary fields including information technology (IT) have emerged. The technological

revolution in the last four decades has made tremendous impact on the way information is processed, stored, retrieved, and disseminated. The growth and development of Information Technology (IT) is one of the most significant achievements of the present century. Information technology is a combination of computers, telecommunications, reprography, microforms including CD-ROM, online, networking, database technologies. IT is being considered as one of the key factors in shaping the present societies and formulating policies for the future. It is transforming the way health care is delivered and biomedical research is done. Innovations such as computer-based bibliographical, clinical, geographical, meteorological and psychological information systems, community health information network, tele-medicine and new ways of distributing biomedical information to consumers are beginning to affect the cost, quality, and accessibility of biomedicine. The use of computers in ICLs started in 1960's for production of indices. Presently the use of computers has led to the concept of virtual library, digital library and paperless library.

OBJECTIVES OF THE STUDY

The objectives of the study are:

1. To evaluate the status of computer *vis-a-vis* current scenario of biomedical ICLs in India; and also to assess the availability and use of latest hardware (HW) and software (SW);
2. To identify and examine different aspects of computers, the problems associated with rapid spread of computers and to find out

solutions i.e. ways and means to solve the problems to meet the changing needs of biomedical information users, ICLs and ICL professionals;

3. To determine:

- (a) the impact of computers on the practice of biomedical librarianship;
- (b) the use of computers by the biomedical ICLs, users and professionals and relationship among these;
- (c) changing role of biomedical ICLs, professionals, and users and preparedness to cope with the changing scenario;
- (d) to identify, the impact of computers on employment, qualification and career development in ICL services, so that they can contribute in the design and new information services development.

4. To identify the Government of India's (GOI's) policies for the promotion of IT, in general and computer in particular if any and the impact of cultural factors in the implementation and also to examine and analyse the implications of such S&T policies; their reliability at source, and recommend a plan of action to improve the existing lacunae in the "National Policy" to develop a model Indian Biomedical Information System (IBMIS);

5. To identify the impact of computers on organisational structures in relation to the overall structure of the parent body;

6. To analyse and evaluate existing computer facilities/programs in biomedical ICLs for adequate training of professionals, semi-professionals and the users, for using the latest IT facilities (techniques/services) based on the newly emerging IT; and

7. To create the awareness and acceptability of Resource Sharing (RS), networking,

creation and access of databases (local, regional, national and international) with the help of modern IT including computer in such a way to suit to Indian ICLs.

REVIEW OF RESEARCH

Various researchers have mentioned the concept of mechanical information search and retrieval in ICL's since 1930's. A fifty-year review of the history of biomedical librarianship is reflected in the four editions of "Handbook of Medical Librarianship and Current Practice in Health Science Librarianship" and "Handbook of Medical Library Practice" [1, 2 and 3]. It reveals the significant changes, that the profession has undergone viz., from selection to collection development, kardex to on-line check in, book form to any desired form, index catalogue to internet, circulation card to integrated ICL system, latern slide to CD-ROM and also combination of all concepts enumerated above. The review on the study areas is potentially contributing analysis of the relations of information IT, etc, indicates that phenomenon is now well understood. Most of the researches are irrelevant and/or of no use. The problems associated with computer and communication of information were carefully examined by Lancaster [4,5], when he talked about the "paperless society".

Special issues on IT of some of the journals have also been brought out. Since 1966 the *Annual Review of Information Science and Technology* contains regular chapters on the different aspects of IT. Presently, this is the most valuable source of current information on impact of IT besides *Library and Information Science Abstracts (LISA)*, and other indexing and abstracting services including *Dissertation Abstracts International (U.K.)*. Most of the professional associations in the field of library and information science have organised conferences, symposia, workshops, etc. at national and international levels devoted to IT in general, as well as its components from time to time. It would be redundant to provide a further review of some of the important studies relevant to the present study.

During the present study on extensive survey of literature/available, it was found that there were about 679 scientific ICLs studies, which involved

health science, agriculture, biotechnology science and technology, space, etc.

The importance of such studies in scientific R & D including biomedicine was recognised quite early in the developed countries viz., U.S.A, U.K., France, etc. however as mentioned above, very limited efforts have been made in the developing countries like India. Not even a single study has been made in particular category of ICLs like biomedicine in India. The present study is an attempt in this direction.

RESEARCH METHODOLOGY

This study was designed, developed and carried out in order to determine the existing position of IT in geographically scattered biomedical ICLs in India. The survey was carried out using "Field Random Sample Survey Research" as the method of research. Questionnaire method has been used as the main instrument for the data collection. Taking into consideration the circumstances and objectives of the present study, a multi method approach has been adopted to suit the Indian environment, employing the use of questionnaires, interviews, literature analysis, data based on secondary documentary sources, technical reports, symposia/conferences, meetings, indirect studies/analysis of records to supplement and complement the data collected through questionnaires to enhance and strengthen its reliability.

Three sets of questionnaires have been used to determine the relationship between IT development, and its uses and applications in the biomedical ICLs by users and professionals. Since the study is focused on IT, obviously the role of government in the technological development in the IT industry for ICLs and the corresponding training and research programmes is supreme and needs have to be analysed. Such analysis was based on secondary information and data, particularly on government policies and plans, documents on the implementation of the plans, and concerned viz., technological policies for IT, their impact on automation, employment, and qualifications as well as government policies in the development of various components of IT. In the wake of various constraints viz., terms, finance, vast geographical scattered populations, that is,

ICL >2000, users >7500 (2000 active users) and about 2000 library and information science professionals, only a stratified random population was selected for the study (ICLs-335, users-850 and professionals-400). A pilot study was also carried out before designing the questionnaire. The response rates were ICL-37.61%(126/335), users-57.4%(488/850), and professionals 56.25%(225/400).

The data regarding ICLs were collected through the first questionnaire, whereas the data related to users and ICL professionals awareness towards the IT, were collected through questionnaires II and III, respectively. Some additional data were also collected through personal interviews of some ICLs, users, and experts of Mumbai, Delhi and Pune. The purpose of interview was also explained to interviewees to seek their full cooperation. The interviews were based on the questionnaires (sets I, II & III). Some of the data have also been collected based on middle and lower categories of staff. Also approached were some of the respondents who had not filled up questionnaires in all the categories either due to lack of knowledge about terminology used, or about IT. The actual impact of IT on ICL's routine services, users, and ICL staff have also been analysed, based on the data available in standard records. In citation analysis, the references cited by the authors at the end of their articles (cross references) were taken as a source for data analysis to study impact of IT on biomedical ICLs, users, and ICL professionals in India.

OBSERVATIONS AND ANALYSIS OF DATA

The questionnaire forms the base for analysing the responses in respect of IT availability, awareness and usefulness in biomedical ICLs in India. An overview analysis of all responses received pertaining to impact of computer technology on ICLs are given below in Tables 1-10 and Figures 1-3.

The study gives a general view of the various technologies available in biomedical ICLs in India during 1994-95 and 1997-98. It is clear that a reasonable number of technologies are available and there is also increase in number, furthermore demand, and use of better hardware and software technologies. The computer facilities, which were

available in 48 ICLs out of 126 surveyed during 1994-95 (38.10%), increased to 72 (57.14%) during 1997-98. Almost all the ICLs have reported increase in number of computer facilities, as well as better hardware and software technologies i.e. only PC to Pentium, DOS operating system (OS) to UNIX and WINDOW with MM, LAN and WAN facilities. Communication facilities include intercom, telephone, telex, fax, satellite, e-mail, etc. Most of the ICLs indicating lack of proper telecommunication facilities were 55.6% while during 1997-98, it was 84.13%. It also indicates that ICLs having photocopying facilities, during 1994-95 were 65.08%, which increased to 80.95% during 1997-98. It also indicates that xerox facility has been provided to most of the ICLs after 1991, while few ICLs had xerox facilities before 1980. Those ICLs, which do not have xeroxing facilities have already proposed for the same.

The study also points out that the biomedical ICLs are also trying to share their resources through local, regional, national and international networks. Those not using networking facility, are trying to have, however, those using local network have proposed national and international networks. During 1994-95, 37(29.37%), ICLs had possessed network facilities (LAN-10, MAN-5, WAN-22), which increased to 69 (54.76%) during 1997-98 (LAN-18, MAN-13, and WAN-38). In the above figures some of the ICLs also have LAN and MAN or LAN, MAN and WAN facilities, and have also indicated that they use above facilities through parent organisation or NIC-NET. It also summarizes that 40.48% biomedical ICLs had on-line and off-line database access facilities during 1994-95, mostly MEDLINE that increased to 66.67% during 1997-98. Only 13.49% ICLs had CD-ROM facilities during 1994-95, which increased to 19.05% during 1997-98. The use of microform facilities mentioned by ICLs are negligible.

COMPUTER TECHNOLOGY

In all the three questionnaires, the respondents were requested to give their opinion regarding the use and awareness about computer(s). The main questions in questionnaire-I included details of computer facilities available for ICLs, and hardware and software used and the various uses of the computer. However, the questionnaire-II and

III containing questions asked from the users and professionals included details of use, known and unknown if used rarely, sometimes or frequently. (Tables 1-9, Fig 1-3). The availability of computer facility in biomedical ICLs, the questionnaires sent during 1994-95 and also sample survey carried out (telephonically) as well as through correspondences, during 1997-98 is summarised in Tables 1-4. It has also been found that information provided during 1995 was missed in 1997-98, while in some of the cases, new ICLs have been included, however, the total same numbers of sample questionnaires (I, II and III) taken into consideration during both the periods are: ICLs 126, Users 488 and professionals 225 to make the calculations easier and systematic.

Table 1 and Fig 1 show the increasing trend to use the computer facilities in the various biomedical ICLs for different applications. However, it is mainly budgetary problem, which prevents to do so, as indicated in the remarks column. The total percentage of the ICLs that had computer facilities during 1994-95 was 48 (38.10%), which increased to 72 (57.14%) during 1997-98, which is almost double in number. All the CSIR i.e. (100%) ICLs had computer facilities since 1994-95, however, these ICLs have upgraded their computers in RAM as well as HD capacity and also have upgraded in the latest models of computers to cope with their requirements. The CSIR, ICLs are followed by ICMR i.e. 82.35% (14 out of 17), during 1994-95 and increased to 94.12% (16 out of 17) during 1997-98. During 1997-98 sample survey, those ICLs, which did not respond, old figures have been taken. It also indicates that almost all the categories of ICLs have increased in number towards automation. Least computer facilities are available with ICAR i.e. 23.08% (6 out of 26) and MCs 23.18% (13 out of 56), while Government, DST and DBT, and UGC have 47% and 40% respectively. These figures increased during 1997-98 to 37.5% in MCs, ICMR 94.12%, while 50% in ICAR and 82.35% in Government (including DST and DBT), whereas UGC and others have 60%. It is also experienced during 1997-98 sample survey that the trend is to have atleast Pentium computer with MM kits, including scanners and provision to have multi-disk, different sized disk drive facilities including CD-ROM drive.

Table 1

Availability of Computer Technology in Biomedical ICLs in India

Sr. No.	Category of ICLs	Total No. of Respondent ICLs	Total No. and % of ICLs Computer Available					
			1994 - 95			1997- 98		
			Total ICLs	% within group	Total Percent	Total ICLs	% within group	Total Percent
1.	ICMR	17	14	82.35	11.11	16	94.12	12.70
2.	MC	56	13	23.21	10.32	21	37.50	16.67
3.	CSIR	5	5	100.00	3.97	5	100.00	3.97
4.	ICAR	26	6	23.08	4.76	13	50.00	10.32
5.	Govt. DST, DBT	17	8	47.06	6.35	14	82.35	11.11
6.	UGC and Others	5	2	40.00	1.59	3	60.00	2.38
Total		126	48	—	38.10	72	—	57.14

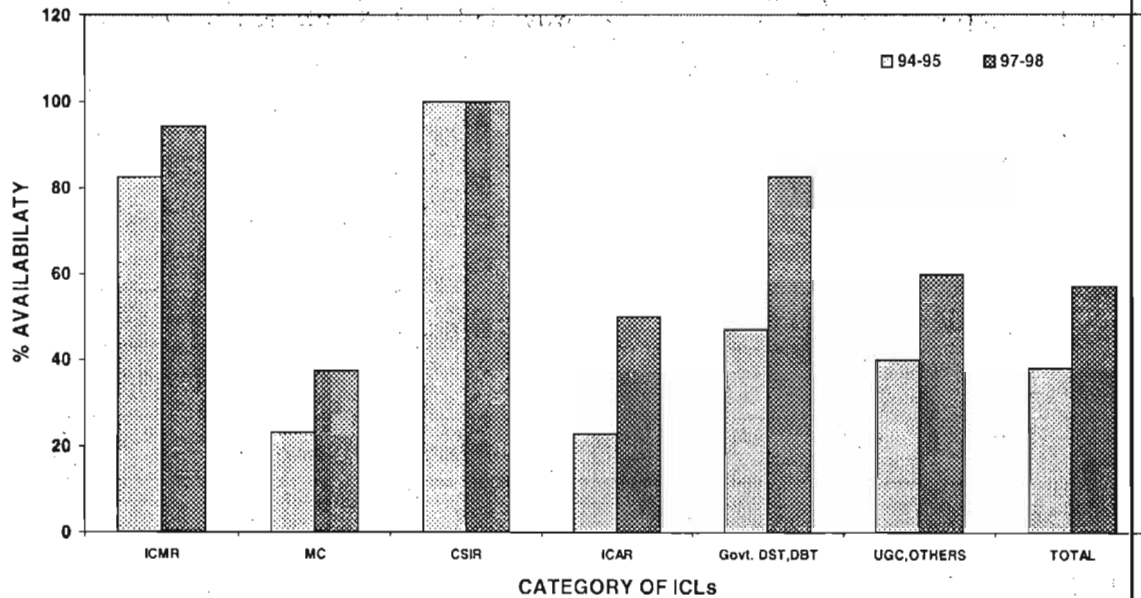


Fig. 1: Availability of Computer Technology in Biomedical ICLs in India (1994-95 & 1997-98)

Number of Computers Available/Proposed

The number of computers has also increased from 84 (1994-95) to 188 (1997-98), while the proposed numbers of computers have decreased from 128 (1994-95) to 78 during 1997-98. This indicates that biomedical ICLs are going towards saturation and in due course of time, most of the biomedical ICLs will have computer facilities.

Table 2 points out that those ICLs, which already have computer facilities proposed for new computers with the latest hardware and software facilities. It is also experienced that in place of many intelligent computers, ICLs prefer to have one server with many terminals. Most of the ICLs have not mentioned about the type of computers i.e. mainframe, mini, micro (i.e. PC, PC/XT or PC-386 486, Pentium). Only five out of 48 (1994-95) have PC-486, while the computers purchased between 1997-1998 are either Pentiums or PC-486. It is also mentioned that those ICLs, which have not acquired computer facilities are either in the process of acquiring or have already proposed. It indicates that almost all the biomedical ICLs want their systems to be automated for which computer is one of the key components.

Type of Printers Available

The ICLs were asked to describe the numbers, and types of printers (i.e. dot matrix, daisy wheel, line and laser, laser jet printer, etc.) available with them.

Table 3 shows that out of 126 ICLs, only 72 ICLs (63.88%) had computer facilities during 1997-98, however, acquired > 188 computers, only 137 printers are available. But 26 ICLs did not mention about the type of printers, but indicated only number of printers available with them. Most of the printers belong to ICLs, however, only 4 have mentioned that they share with others. Most of the ICLs i.e. 119 (86.86%), have dot matrix printers, while only one line printer and two daisy wheel printers are available. These ICLs feel that daisy wheel printers are out dated now. Number of laser printers available are 15 (10.95%), mostly purchased between 1996 and 1998. Trend also shows that ICLs are interested to have laser printer to print MM based documents. During late 1998 and early 1999 colour printers have been reported. However, the number of such ICLs are negligible. Just like new generation of processors are making wave in the IT, a new generation of peripherals

Table 2

Total Number of Computers Available/Proposed in Biomedical ICLs in India

Sr. No.	Type of ICLs	Number of Computers Available ICLs			
		1994-95		1997-98	
		Available	Proposed	Available	Proposed
1.	ICMR	25	34	50	16
2.	MC	13	30	40	18
3.	CSIR	24	25	45	10
4.	ICAR	6	21	18	14
5.	Govt., DST, DBT	12	16	28	12
6.	UGC and Others	4	2	7	8
	Total	84	128	188	78

are also coming up with faster and better laser printers, scanners, colour desk jet printers as well as intelligent plotters.

available with them, and the computer programming languages used to develop in-house softwares if any. (Table 4).

Computer Operating Systems (OS) Used in ICLs

In the questionnaire-I, ICLs were requested to provide information regarding the various OSs

The survey revealed that most of the ICLs use more than one OSs. DOS is the most favoured/used OS due to various reasons, however, after 1995 increasing demand of WINDOWS cannot be ruled out. Of the 103 reported, 42 (40.78%) use

Table 3

Type of Printers Available

Sr.No.	Category of ICLs	Type of Printers (1997-98)				Total
		Dot Matrix	Line Printer	Daisy Wheel	Laser	
1	ICMR	29	-	1	-	30
2	MC	31	-	-	1	32
3	CSIR	28	-	1	5	34
4	ICAR	16	-	-	-	16
5	Govt. DST, DBT	9	1	-	8	18
6	UGC and Others	6	-	-	1	7
7	Not mentioned	-	-	-	-	-
Total		119	1	2	15	137
Percentage		(86.86)	(0.73)	(1.46)	(10.95)	—

Table 4

OSs Used (1997-98)

Sr. No.	Name of OS	ICMR	MC	CSIR	ICAR	Cent. Govt.	UGC & others	Total (Percentage)
1.	DOS	14	17	3	4	2	2	42 (40.78)
2.	UNIX	2	1	4	1	1	1	10 (9.71)
3.	XENIX	1	-	1	-	1	-	3 (2.91)
4.	WINDOWS	4	9	4	10	5	2	34 (33.01)
5.	Others	-	-	-	-	-	-	-
6.	Not mentioned*	4	5	-	2	3	-	14 (13.59)
Total		25	32	12	17	12	5	103

*Most of the ICLs using more than one OSs have been included in the total.

DOS, 10 use (9.71%) UNIX, and 3 (2.91%) use XENIX, however 14 did not mention about the OSs. Since 1997 most of the ICLs show WINDOWS as their first choice (33.01%). Due to changing scenario, it has now become essential to have an OS, which can support networking, on-line access, CD-ROM provisions, MM, e-mail, internet access, etc. It has also been experienced that some computer problems are only due to OS.

Softwares Used in Biomedical ICLs

Regarding the various library SWs used, the ICLs were requested to describe their SWs not only for ICL functions but also to provide assistance in procurement and difficulties, if any. It reveals that majority of ICLs use more than one library SWs. In the beginning, small sized as well as middle sized ICLs tried to develop local in-house SW(s) set up, however most of them failed because of incompleteness, lack of integration, and knowledge of programming language furthermore multi-user, multi-tasking support facilities. They have also mentioned that the above SWs were either in-house developed or received free of cost. Among the respondent ICLs, only 35% have agreed to provide their expert assistance to others in the case of any difficulty or set up new

automation system. Remaining 65% either have not mentioned or expressed their inability to assist. (Table 5).

As indicated in Table 5, CDS/ISIS is highly used library SW in 40 (32.26%) organisations. It may be due to free distribution by UNESCO through NISSAT to the government and not for profit making organisations, furthermore, its powerful retrieval system. This is followed by in-house developed SWs i.e. 34 (27.42%), while 29 (23.39%) SW, which are other than LIBSYS (9.68%), SLIM (4.03%), CDS/ISIS (32.26%). It is also indicates that most of the in-house developed SWs are based on dbase III/IV or foxpro. CDS/ISIS has given a new vision to develop automation culture in India. It was also experienced during the survey that most of the ICLs have purchased their computers without proper home work (planning) about their present and future requirements including library HW and SW compatibility, after sales service, etc. In some of the cases, those who have purchased the computer, it took 3-4 years to purchase the library SWs, by the time HW became obsolete or incompatible to SW. Survey also reveals that 19% of acquired SWs are **never used**, 45% used **frequently**, 36% used only **some time**. It is also indicated that whenever

Table 5

Library SW Packages for ICLs (1997-98)

Sr No	Type of ICLs	SW of ICLs (1997-98)							Total
		LIBSYS	ISIS	SLIM	SANJAY	MAITRATYE	INHOUSE	OTHERS	
1	ICMR	1	10	-	-	-	10	21	42
2	MC	3	14	1	-	-	7	2	27
3	CSIR	1	6	1	1	-	4	1	14
4	ICAR	4	4	-	2	-	4	3	17
5	Govt. DST, DBT	2	5	2	1	-	8	1	19
6	UGC and Others	1	1	1	-	-	1	1	5
Total		12	40	5	4	-	34	29	124
Percentage		9.68	32.26	4.03	3.23	-	27.42	23.39	

*(Some of the ICLs using > one SW for library applications).

SW was purchased, after sales service aspects have not been taken into consideration. This is a general problem reported by most of the ICLs. Most of the ICLs indicated that integrated library SW is required and should have the provision of all the ICL applications, bar-coding, networking and CD-ROM, furthermore to support the MM based IS&R. The reasons of purchasing HW without SW include lack of computer knowledge by professionals, budget and the least priority to ICLs as mentioned by most of the professionals. Problems regarding library SW for support and maintenance have also been pointed out by the ICLs. They have reported that since they are not

programmers, and it is monopoly of SW supplier to give irregular service, increasing SW price, from time to time, etc.

Users of Computers in Biomedical Information Centres and Libraries

ICLs are increasingly automating all the ICLs functions. A reasonable number of biomedical ICLs in India have automated one or more of their functions. In the questionnaire-I, ICLs have mentioned the various uses of computers in their ICL's operations. The application-wise details are summarised in Table 6.

Table 6

Various uses of computers in Biomedical ICLs in India (1997-98)

Sr. No.	ICL Operations	No. of ICLs						Percent of Total (72)
		ICMR (16)	MC (21)	CSIR (5)	ICAR (13)	Govt. DST, DBT (14)	UGC and Others (3)	
1	Acquisition	3	5	3	2	5	1	19 (26.39)
2	Cataloguing	4	6	3	6	6	2	27 (37.51)
3	CAS/SDI	6	4	5	8	7	2	32 (44.44)
4	Database creation	11	12	5	8	7	2	45 (62.51)
5	Database searching	14	12	5	8	7	2	48 (66.67)
6	Circulation control	2	3	3	2	3	3	16 (22.22)
7	Serial control	2	3	3	3	3	2	16 (22.22)
8	Product Inf. Services	-	-	2	-	-	-	2 (2.78)
9	Thesaurus construction	-	-	-	-	-	-	-
10	Word processing	16	21	5	13	14	3	72 (100)
11	Others	3	2	5	2	1	1	14 (19.44)

(Also indicates the numbers of respondent ICLs where computer facilities are available.)

It is seen that word processing is being carried out by all the respondent ICLs, few ICLs do only acquisition, while some carryout acquisition and cataloguing, very few, if not negligible ICLs are carrying out all the ICL operations. In all 72 out of 126 respondent ICLs have computer facilities and only 26.39% (19) carry out acquisition, 37.51% (27) cataloguing, 44.44% (32) CAS/SDI, 62.51% (45) creation of database and about same numbers of ICLs i.e. 48 (66.67%) use computers for database searches. About 22.22% (16) respondent ICLs use computers for both circulation and serials control. It indicates that almost all the ICLs, those using computer for circulation also use them for their serials control. Not a single ICL has mentioned about the use of computer for thesaurus construction, however, the lowest number of ICLs i.e. 2.78%(2), have mentioned about the product information services. A reasonable number of ICLs i.e. 19.44%(14) (as per Indian scenario), have indicated other applications, i.e. generating current list of

periodicals, compiling papers published by their scientists, indexing, subject-wise preparation of bibliographies, compiling directories, their documentation list, etc. The fact, that the package distributed by NISSAT i.e. CDS/ISIS has given a new direction towards the automation of biomedical ICLs in India.

Level of Achieved Objectives of Computerisation

In this column of the questionnaire-I, respondent ICLs were requested to indicate about the percentage (i.e. 100%, 75%, 50%, 25%, <25%) of their objectives obtained in the process of automation by using different SWs. The details of the levels of automation are summarised in Table 7. A comparison of the surveys (1994-95 & 1997-98), indicates that there is a trend towards automation, however it is very slow towards complete automation. The reasons mentioned by most respondents are: lack of staff, specially

Table 7

Level of Achieved Objectives of Automation of Biomedical ICLs

Sr No	Type of ICLs	Achieved Objectives of Automation (1994-95 & 1997-98)									
		100%		75%		50%		25%		<25%	
		94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98
1	ICMR (14/16)	-	1	1	2	4	5	4	4	5	4
2	MC (13/21)	1	2	2	3	3	6	3	4	4	6
3	CSIR (5/5)	-	2	2	3	2	1	-	1	1	-
4	ICAR (6/13)	-	1	1	2	2	4	2	2	1	5
5	Govt., DST/DBT (8/14)	1	3	3	3	2	3	-	2	2	8
6	UGC and Others (2/3)	-	-	-	-	-	1	2	1	-	1
Total (48/72)		2	9	9	13	13	20	11	14	13	24
Percentage		4.17	12.5	18.75	18.06	27.08	27.78	22.91	19.44	27.08	33.33

skilled qualified staff and also availability of HW and SW at different interval of time. Some of the respondents have also mentioned that the authority gives the least priority to ICL. During 1994-95 only two (4.17%) ICLs were fully automated, while during 1997-98, this was 9 (12.5%). In the 75% automation column during 1994-95, it was 18.75% and decreased to 18.06%, while number increased from 9 to 13 during 1997-98. It means the number of ICLs for automation increased however, the percentage of automation, more or less remained the same in case of 50% and 75% automation. In the 50% category, there is slight increase i.e. 27.08% to 27.78%, whereas in 25% column there is decrease in the percentage i.e. 22.91% to 19.44%. However, number increased from 11 to 14, whereas a reasonable increase in <25% has been indicated i.e. 22.08% to 33.33%. About 35% respondent ICLs have mentioned that they use computer based services **very frequently**, while about 45% **often**, 15% **some times**, and only 5% indicated **rarely**.

It is also seen that there are tremendous changes with very slow development towards the complete automation of biomedical ICLs in India since 1991 onwards, however, the scenario for automation is encouraging. Earlier, some ICLs, sharing NIC computer facilities have shifted to have their own exclusively for ICLs. Some of the respondents have also mentioned that in the last 10-15 years, number of staff remained the same, while the collection, budget and ICLs services have increased multifold and they find it very difficult to cope with routine jobs. There is also ban in the recruitments or creation of new posts. They are even fully aware of the developments around them, however, unable to do so due to the above reasons.

Impact: Use and Awareness of Computer Technology on ICLs

In the concluding parts of the questionnaire-I, respondent ICLs were asked to indicate their use and awareness of computer technology i.e. used rarely, some times, and frequently, known and unknown, can't say. The replies received from various ICLs users and professionals are

compared in the Figure 2. Responses received from various ICLs are given in Table 8. During 1994-95, 48 (38.10%) biomedical ICLs have used computer technology: **rarely** 21 (16.67%), **sometimes** 18 (14.29%) and **frequently** 9 (7.14%), while 60 (47.62%) indicated that the computer facilities are known to them however, they do not use. Only 13 (10.32%) expressed their unawareness of computer facilities, while 5 (3.97%) have not mentioned anything. However, during 1997-98, the numbers of ICLs using computer facilities increased to 72 (57.14%). During this period 18 (14.29%) used **rarely**, 31 (24.60%) **sometimes**, while 23 (18.25%) have mentioned used **frequently**. Only 4 (3.17%) have indicated that they know about the computer facility, however did not use the same, while 20(15.87%) do not know, and 38 (23.81%) have not mentioned about their computer knowledge. It indicates that in ICLs, frequent users of computers are increasing, however, in the case **rare** and **sometimes**, users remain more or less the same.

All the groups (ICLs, users, and professionals) have given their views alternatively but these figures can not be compared with developed countries. Increasing uses of computers have enormous potential to assist in the IS&R especially for ICLs.

Fig.2 compares the use and awareness of computers among ICLs, users and professionals. It also indicates that ICLs frequent use of computer facility is 18.25%, while users 5.94%, and professionals 21.78%. In the column **sometimes**, 24.60% of ICLs, 7.79% of users, and 22.22% of professionals indicated that they use computer as and when required. The survey reveals that those who used computer **rarely** earlier, are using **sometime** and/or **frequently**. It also points out that professionals (20%) use above facility **rarely** while it is (19.06%) and (14.29%) in the case of users and ICLs respectively. It can be concluded that professionals have more awareness and also use computer facilities more than ICLs and users who have just started to use computers, however, awareness among them about computer facilities are increasing.

Table 8

Impact: Use and Awareness of Computer Technology in Biomedical ICLs in India (1994-95 & 1997-98)

Sr No	Type of ICLs	Used (48/72)												Total
		Rarely		Sometime		Frequently		Known		Unknown		Not mentioned		
		94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98	
1	ICMR (14/16)	5	4	6	8	3	4	3	-	-	-	-	1	17
2	MC (13/21)	7	10	5	6	1	5	32	1	8	14	3	20	56
3	CSIR (5/5)	1	-	2	2	2	3	-	-	-	-	-	-	5
4	ICAR (6/13)	3	3	2	6	1	4	16	1	3	5	1	7	26
5	Govt. DST, DBT (8/14)	4	1	2	7	2	6	7	2	1	1	1	-	17
6	UGC and Others (2/3)	1	-	1	2	-	1	2	-	1	-	-	2	5
Total 48/72		21	18	18	31	9	23	60	4	13	20	5	30	126
Percentage		16.67	14.29	14.29	24.60	7.14	18.25	47.62	3.17	10.32	15.87	3.97	23.81	

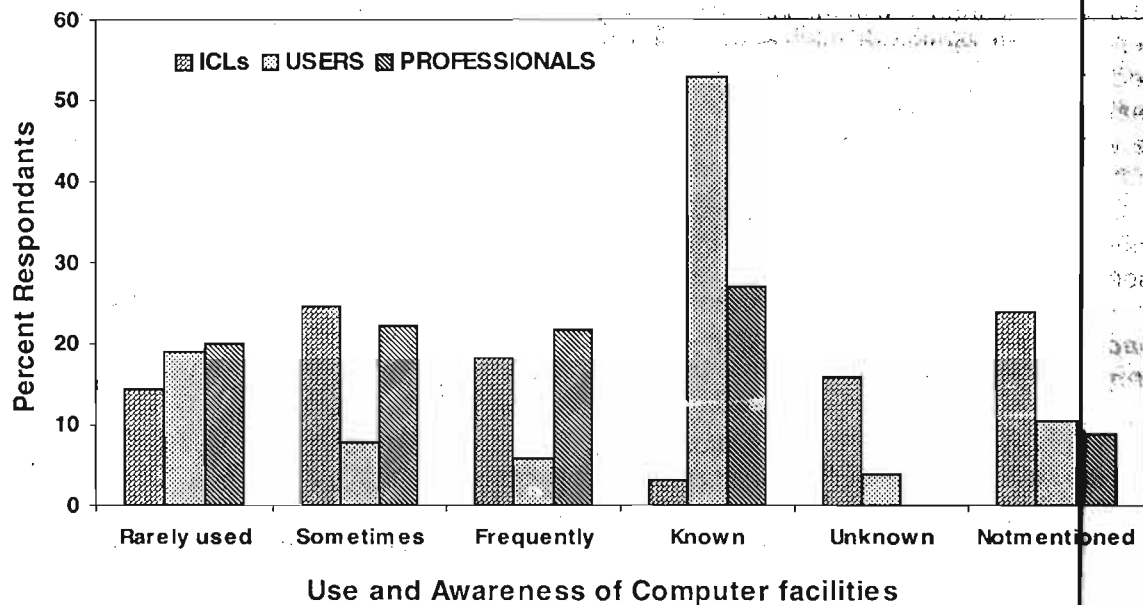


Fig. 2 : Impact : Use and Awareness of Computer Technology on Biomedical ICLs, Users and Professionals (1997-98)

Use and Awareness of Computer Facilities

In all the three questionnaires (I, II and III) ICLs, users and professionals were asked to grade the objectives (**very useful/upto the mark, satisfied, cannot say**), achieved through computer facilities. It has been summarized in Table 9 and Fig 3. All the groups (ICLs, users, and professionals) have given their views alternatively however, these figures cannot be compared with developed countries.

The respondent ICLs indicate (Table 9) that during 1994-95, 22.92% ICLs expressed their satisfaction and mentioned upto the mark, which increased to 25% during 1997-98, while 39.59% mentioned satisfactory during 1994-95, which decreased to 26.39% during 1997-98. The percentage of not satisfied respondent ICLs is 12.5% (1994-95) and 30.56% (1997-98). It indicates that though the number of ICLs is increasing as regards automation, however, dissatisfaction is also increasing in some of the cases because ICLs

Table 9

Gradation: Objectives Achieved through Computer Technology by Biomedical ICLs in India (1994-95 & 1997-98)

Sr No	Cat. of ICL	Very useful (Upto the Mark) nos.		Satisfactory nos.		Not satisfactory nos.		Can't specify nos.		Not mentioned nos.	
		94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98	94-95	97-98
1	ICMR (14/16)	4	5	3	3	-	5	1	2	-	-
2	MC (13/21)	1	3	8	8	3	6	1	3	6	1
3	CSIR (5/5)	2	2	1	1	1	3	1	1	-	-
4	ICAR (6/13)	-	1	2	3	2	5	1	1	1	3
5	Govt. DST, DBT (9/12)	3	6	4	4	-	1	1	-	-	1
6	UGC and Others (2/3)	1	1	1	-	-	2	-	-	-	-
Total (48/72)		11	18	19	19	6	22	5	7	7	5
Percentage		22.92	25.00	39.59	26.39	12.5	30.56	10.42	9.72	14.58	6.94

Only ICLs possessing computers have been included in the percentage.

$$\text{Total \%} = \frac{\text{No. of ICLs graded}}{\text{Total No. of ICLs having Computers}} \times 100$$

want to carry out more but are unable to do so due to various reasons. Most of the ICLs proposed to have additional budget for automation, however, the proportionate budget is decreasing. On the contrary, there is drastic cut even in their regular budgets and are finding very difficult to manage even the day to day requirements and automation activities have become secondary or least priority for want of funds and also lack of qualified staff. Number of ICLs staff is also decreasing in some of the cases. It has also been mentioned that the posts of those staff, who have retired or left are lying vacant for a long time.

About 10.42% (1994-95) and 9.72% and (1997-98) respondent ICLs mentioned in can't specify column, while 14.58% (1994-95) and 6.94% (1997-98) did not mentioned anything in this regard. It is also indicated that available computer facilities are under used. Though all the biomedical ICLs do not have computer facilities, however almost all the ICLs have shown their interest towards the automation, on-line searching, etc. The trend also shows that if increase in computer continues, by the year 2010 most of the biomedical ICLs in India will partially if not fully, be automated. It has also been indicated that those ICLs, which have already

been automated, are trying to adopt more advanced and the latest computer HW and SW with ITs, viz. MM, internet, intranet, extra-net.

It is indicated that most of the ICLs, users, as well as professionals found the computer facility **very useful**; however, most of them expressed their dissatisfaction about the computer facilities available in the biomedical ICLs in India due to various reasons. Majority of professionals are not happy with after sales service i.e. maintenance of HW and SW. It is also indicated in some of the remarks columns that due to lack of proper HW and SW they are unable to use the computer facility at the desirable extent. A comparative summary of gradation of objectives achieved through computer by ICLs, users and professionals has been given in Fig 3. It is indicated that most of ICLs, users, as well as professionals are satisfied with available computers. Among the respondents 25% ICLs, 25.33% professionals, 16.80% users are **very satisfied**, while 26.39% ICLs, 20.69% users, and 46.22% professionals indicated **satisfactory**, however a reasonable numbers of ICLs 30.56%, users 33.61%, and professionals 24.44% are **not satisfied**.

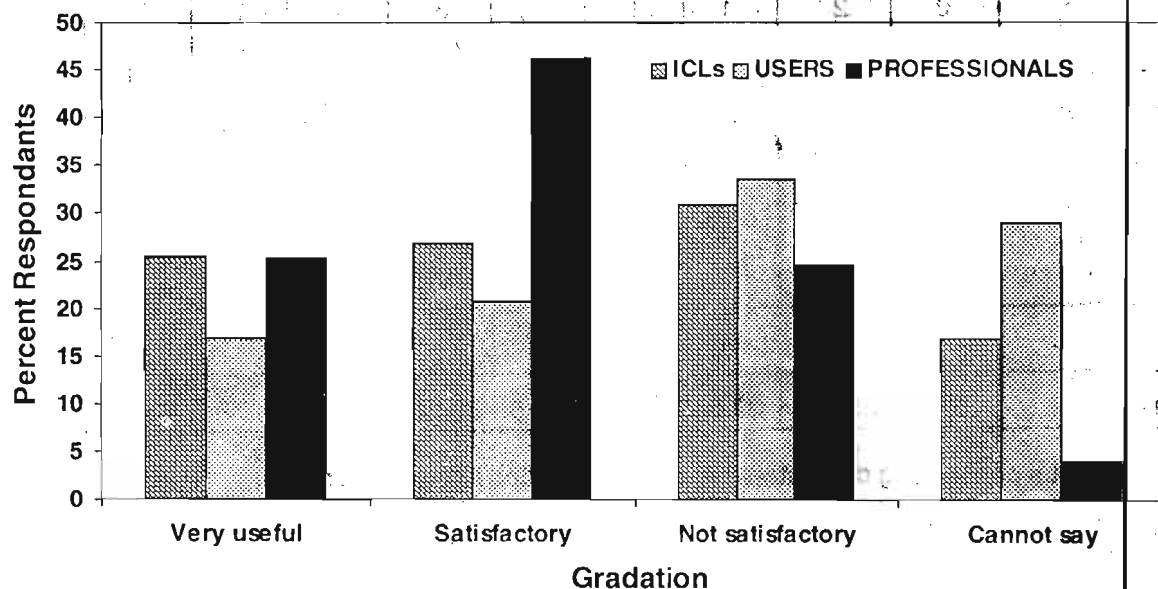


Fig. 3 : Gradation : Objectives Achieved through Computer Technology by ICLs, Users and Professionals (1997-98)

MAJOR FINDINGS

The majority of users of ICLs in the study expressed that all staff except clerical should have higher qualifications than before due to the introduction of IT. Findings also confirm that job involved more time for routine works, however, due to IT various lengthy and repeated processes have been reduced and expedite the various services.

There is multifold increase in use of computers, it is 38% (1994-95) to 53.12% (1997-98). For the HW is from PC to Pentium III, while in the case of printers, line-printer to daisy wheel (now totally obsolete), DOT matrix to LASER (coloured) and LASER jet. It is also indicated that numbers of printers are less than that of the total computers available with ICLs and are being shared among the various computers.

Maximum used operating system is DOS (40.78%), while minimum is UNIX (9.71%), however, most of the ICLs use more than one OS. Highly used SW for ICLs is CDS/ISIS (32.26%), while LIBSYS (9.68%) is the most appreciated but costliest package reported. There is also very slow development towards the complete automation. Reasons given are: availability of HW and SW at different interval of time, least priority to ICLs, improper HW and SW configuration, lack of budget and trained staff.

Almost all the computers procured are underutilised. About 90% of the biomedical ICLs in India do not use computers fully, however, the number of ICLs using computers is reasonably less. There are also some ICLs that have not ever unpacked their machines even after 9-10 months of purchasing. It is also indicated that HW and SW are available at different interval of times which leads to compatibility and outdatedness.

Some of the ICLs are not very clear about HW and SW i.e., RAM, speed, hard disk capacity, capability and other accessories procured. In some cases, computers procured are not as per requirement of ICLs and officer-in-charge does not know, how HW and SW were procured and given to the ICLs. The reasons mentioned by most of the respondents are due to government policy, and its delay at the institutional/organizational level

and ICL as a non-priority item declared by authorities.

Most of the ICLs have many computers performing various ICL applications separately. However, it should be one server with many terminals with provision of break down and/or stand by computers.

Some of the ICLs have hardware without suitable software support. There is also lack of integrated library SW in most of the ICLs to perform all the ICLs applications with one SW. Different SW are being used for different ICLs applications. There is also lack of multi user and multi tasking facility (LAN and other networking facilities). Not a single ICL has the bar code provision. Professionals do not possess knowledge of programming languages hence, in-house development of support service is not possible, which is essential for any software and hardware.

Biomedical information users depend on computer facility for the various purposes viz., state of the art reports, article writing, general awareness, report preparation, answer to the specific queries, lecture notes, clinical practice, decision making especially during epidemic and emergency cases. Though they receive their information through conventional and non-conventional sources; they still prefer computer-based services.

The study shows that computer based networking technology is gaining prominence. Almost all the biomedical ICLs use various computerised database services (on-line and/or off-line) and these are extremely beneficial where printed indices and abstracts are being used.

CONCLUSION

It can be concluded from the discussions above that there is no single impact of computer technology on biomedical ICLs work in India. Every biomedical ICLs will choose the most suitable ways and means considering that introduction of computer based services will change the future of biomedical ICLs. The successful use of modern IT especially computers in biomedical ICLs in India will be beneficial but will largely depend on problems at organisational level. Further research in ILSc in this regard may help the biomedical

scientists and doctors to cope with the revolution in their field of biomedical information and initiate a change from quantity to quality in scientific information and knowledge. Though the efforts have already been started and initiatives have been taken however, they need improvements in terms of IT facilities, level of services, coping with multi disciplinary approaches irrespective of form, formats, location and language. We have a long history of biomedical ICLs in India however which so far have traditional tools and technologies. These have to be modernised with help of latest IT in order to face the present challenges to provide active, efficient and effective support to our biomedical programmes and activities.

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REFERENCES

- 1 ANNON (GL). The Medical Library Association in retrospect, 1937-67. *Bull. Med. Lib. Assn.* 55, 4; 1967; 379-89.
- 2 ASHWORTH (W). Handbook of special librarianship and information work 3rd ed. 1967; London, ASLIB. 390-411.
- 3 BUSTON, (Paul F). Information Technology and Organisational Structure. *ASLIB Proceedings.* 30, 3; 1988; 57-68.
- 4 LANCASTER (FW). Towards paperless information. 1980. New York. Academic Press.
- 5 LANCASTER (FW). Whither Libraries. *College Res. Libr.* 39; 1978; 345-7.