Chapter 4: Bibliographic and Full-Text Databases in India

4.1 Introduction

The national investment on research & development (R&D) and related science & technology (S&T) activities during 2000-2001 has been of the order of Rs.17660.28 crore which was 0.91% of Gross National Product (GNP). The major share of R&D expenditure was met from Government sources (78.6%), and 21.4% being met from the private industry. More than 3.08 lakhs personnel were employed in R&D establishments. Although precise statistics are not available, it may be stated that the 'information support' for the stock of these personnel and the activities (as a proportion of the investment mentioned) has not been commensurate. In quantitative terms, the investment could be significant but most of it was perhaps utilized to build up library resources.

4.2 Development of Indian Databases

Indian efforts made in the past or those planned for immediate future, have one or more of the following objectives [9].

- To organize national or nationally produced information;
- To create databases in narrow subject areas relevant to national socio-economic situation; and
- To develop indigenous capabilities for database creation and utilization.

Government Informatics and databases have three major components i.e., at Central Govt. level, State Govt. level, for district administration and Public Sector for
the databases developed by and for them. Excepting databases developed by Public Sector, National Informatics Centre is responsible for maintenance of databases along with respective administrative bodies.

4.3 Development of Information Systems and Programmes

There has been rapid development of information systems and programme. Most of them are international in many aspects. The input data created at different national focal points are merged and processed at the international centre and the processed data are sent back to national focal point for providing services to their immediate users. National input ensures for each participating country, the receipt of a complete database generated by the international agency {11}. The usefulness of such a database depends on the national services that can be planned and provided from them. The two most important services that are usually thought of in this context are SDI and bibliographic services—both on demand and in-anticipation {10}.

The aims of these endeavors have been as follows:-

(a) The databases would complement and supplement international databases, and

(b) The databases would serve the archival/recording functions of information generated indigenously.

4.3.1 National Social Science Documentation Centre (NASSDOC)

The need for National Information Systems in India was felt in 1970s in order to achieve maximum utilization of national resources and to avoid unnecessary duplication of materials in different information centres. NASSDOC under the Indian Council for Social Science Research (ICSSR) emerges as a focal point for all documentation activities carried out in the field of social sciences in India. The centre
not only coordinates documentation activities in India but also plays a vital role in networking by co-operating with Asia Pacific Information Network in Social Sciences (APINESS) at international level. NASSDOC has acquired databases like Austrom and Popline on CD-ROM and provides bibliographic services from these databases. It has also installed UNESCO based CD-ROM prototypes and it contains six databases viz. UNESBIB, IBEDOCS, ICOMMOS, DARE, ENERGY and UNESDATA. NASSDOC has also developed some of the indigenous databases in social sciences, which are as follows:

**Union Catalogue of Social Science Periodicals**

A union catalogue of social science periodicals in Delhi libraries has been prepared by NASSDOC, which lists about 7,000 periodicals in about 68 libraries. NASSDOC plans to cover the country through a series of such city-wise, state-wise or geographic region-wise catalogues. Catalogues of serial titles other than periodicals would also follow [16].

**Union Catalogue of CD-ROM Databases in Social Science Libraries in India**

This catalogue covers information of about 132 CD-ROM databases available in 40 major libraries and information centres in India. It provides information about the title of CD-ROM database, frequency, brief annotation, information about the producer/vendor and library symbols along with holdings of the respective CD-ROM databases. The list of detailed information of the library (indicating library symbols, complete address, contact person, telephone, fax, e-mail, website and mode of services etc.) is also provided. The database is available on payment basis. It is
also available in printed as well as in digital form. The search can be made by the title and keywords.

**Indian Social Science Periodicals Literature (INSPEL)**

NASSDOC is planning to create an integrated and computerized database of articles published in 240 Indian social science journals since its inception in 1970. Indexes of some of these journals covering main disciplines are already available in published form. It consists of 43,272 issues of journals containing 3,46,176 articles, thus providing reasonable control over the literature published in Indian social science periodicals during the last 100 years or so. This whole database would be available in CD-ROMS soon and later on the web. The indexes so far published are:

- India Education Index
- Index to Indian Periodicals: Sociology & Psychology
- Index to Indian Periodicals: Economics
- Index to Indian Periodicals: Political Science
- Index to Indian Periodicals: Geography, History, and Sociology etc.

**Bibliography of Indian Literature on Asia**

The Documentation Centre on Asian Studies (DOCAS) at Indian Council of Social Sciences Research is working on the databases of bibliography of Indian literature on Asia. It aims to bring under bibliographical control over the literature published in India on Asian studies. About 2000 records have been computerized. Search can be made by author, title and keyword [4].
Database of Research Project Reports

It covers bibliographic details of 3000 research project reports funded by the ICSSR as well as by other organizations. The database is available both in printed as well as in digital form (CD-ROM). The search can be made by title, author and subject.

4.3.2 National Institute of Science Communication and Information Resources (NISCAIR)

It came into existence on 30/09/02 with the merger of National Institute of Science Communication (NISCOM) and Indian National Scientific Documentation Centre (INSDOC). Both NISCOM and INSDOC, two premier institutes of the CSIR were devoted to dissemination and documentation of S & T information. NISCOM had been in existence for the last 6 decades (First as two publication units of CSIR), which were merged to form a Publication Division, which was later renamed as Publication and Information Directorate and in 1996 again renamed as NISCOM.

INSDOC came into being in 1952 and was engaged in providing S&T information and documentation services through various activities such as abstracting and indexing services, design and development of database, library automation, providing access to international information sources, consultancy services etc INSDOC is also host of National Science Library and the SAARC Documentation Centre. INSDOC was involved in designing of databases using state-of-the-art information technology tools. Some of the indigenous databases developed by NISCAIR are available on CD_ROM as well as online.
Indian Science Abstracts (ISA)

Generation of an abstracting service covering all the papers published in Indian science and technology journals was taken up by the erstwhile INSDOC, New Delhi way back in 1965. The coverage of journals in Indian Science Abstracts (ISA) has increased from 294 in 1983-84 to 24,805 in 2005. Besides journal articles, ISA has been covering patents, standards, theses and conference proceedings. On an average, about 2,000 entries are recorded in a fortnightly publication. An attempt is now being made to cover papers of Indian authors published in foreign periodicals. [18].

Table 4.1. Growth of Indian Science Abstracts

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>24,805</td>
</tr>
<tr>
<td>2004</td>
<td>23,996</td>
</tr>
<tr>
<td>2003</td>
<td>22,947</td>
</tr>
<tr>
<td>2002</td>
<td>21,778</td>
</tr>
</tbody>
</table>

Indian Science Abstract has been computerizing the ISA database. Till now, two lakhs abstracts covering the period from Jan.1990 to Dec. 1999 has been brought out in the form of CD-ROM.

National Union Catalogue of Scientific Serials in India

The National Union Catalogue of Scientific Serials in India (NUCSSI) produced by the NISCAIR contains holdings data relating to 35,000 titles of which 18,000 are current (and 2,300 are of Indian origin). The catalogue also brings out the
fact that 70 per cent of total serials acquisition is in English, which indirectly indicate that Indian S&T community cannot derive benefits from the knowledge contained in non-English literature.

It started with the computer processing of the records now converted into database form in collaboration with the National Information System for Science & Technology (NISSAT). Besides, the project envisages annual up dation of information in respect of about 100 selected resources institutions, with a five-year cycle for the baseline adjustment (the present database is updated up to the year 2001).

Keeping pace with the current trends in database industry, NISCAIR has brought out the CD-ROM version of the NUCSSI database. NUCSSI on CD-ROM covers holdings information of nearly 425 major libraries in India and is updated till 2001. The database has a easy menu driven access and is searchable through various options like journal title, library, city, and subject. Experimentation is currently under way to install the NUCSSI database on Indian networks for online search as a part of the larger concept of an S & T referral system.

4.3.3 National Information System for Science and Technology (NISSAT)

In 1977, The National information System for Science and Technology (NISSAT) came into being with the objective to innovate in modern techniques associated with information collection, storage and retrieval. It supported many sectoral information centers in order to provide information storage and retrieval in specialized subjects.
National Access Centres to International Data Services (NACIDS)

To facilitate online access to international information services for the researchers, scientists and technologists in India at par with those available to their counterparts in the developed countries. NISSAT initiated setting up of a NISSAT Access centre to International Data Services (NACIDS) in 1985.

In 1987, five centres were established in Bangalore, Calcutta, Chennai, New Delhi, and Pune. Later on, in 1995 this was extended to Ahmedabad, Hyderabad, Mumbai and Trivandrum. These centers were established with the objective to facilitate online access to international database service as well as development of indigenous databases and to maintain linkages with the various NISSAT centers- National Information centers, NACIDS and library networks in order to help in the provision of efficient and effective information services to users.

Sectoral Information Centres (SICs)

NISSAT established Sectoral Information Centre in different subjects with national in scope of service. They provide bibliographic as well as factual and numeric information to meet the various information needs of academicians, scientists, technologists, entrepreneurs, management executives and decision makers. The Sectoral Centres are usually built around the existing information resources and facilities. They maintain extensive collections of published and unpublished documents in the form of books, periodicals, R&D reports, technical reports, standards, patents and trade literature in their subject areas and on different electronic medias like CD-ROMs etc [17]. Besides providing documents and preparing bibliographies on request, they offer selective dissemination of information (SDI), current awareness services (CAS), reprographic & micrographic services, industrial
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and technical enquiry services, technical translation and similar access-delivery services. Some of the Sectoral Information Centres bring out serial publications of digests, indexing & abstracting materials and news highlights. Apart from publishing these in print form, the information is more often computerized, on CD-ROM, on internet etc.

The Sectoral Information Centres in different subject areas/ Sectors are:-

1. National Information Centre on Leather (NICLAI), Chennai, Tamil Nadu (TN).
2. National Information Centre on Food Science (NICFOS), Mysore, Karnataka (KA).
5. National Information Centre on Textiles (NICTAS), Ahmedabad, Gujarat (GJ).
6. National Information Centre on Chemical and Allied Industries (NICHEM), Pune, Maharashtra (MH).
8. National Information Centre on Marine and Aquatic Science (NICMAS), Goa.
10. National Information Centre on Bibliometrics (NCB), Delhi.

12. National Information Centre on CD-ROMs (NICDROM), Bangalore, Karnataka.


**Database Development by NISAAT**

In pursuance of its thrust on contents development, NISSAT encouraged indigenous database development activities. Besides library catalogues, union catalogues and lists, the activity could be on subjects in which a global database does not exist, or on subjects in which Indian elements are not properly represented [14].

**Table 4.2 Indigenous Database activities supported by NISSAT**

<table>
<thead>
<tr>
<th>Database activity</th>
<th>PI Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Technology Abstracts (FTA)</td>
<td>NICFOS, CFTRI</td>
</tr>
<tr>
<td>INDAB: Database of Indian Abstracting Databases,</td>
<td>ISAC-NISSAT</td>
</tr>
<tr>
<td>Leather Science Abstracts (LESA)</td>
<td>NICLAI, CLRI</td>
</tr>
<tr>
<td>Metal Working Abstracts</td>
<td>NICMAP, CMTI</td>
</tr>
<tr>
<td>Index of Management Journals (JIND)</td>
<td>NICMAN, IIMA</td>
</tr>
<tr>
<td>Oceanline</td>
<td>NICMAS, NIO</td>
</tr>
</tbody>
</table>
4.4 Library Network Development in India

NISSAT initiated development of library networks at various levels [1]. Some factors that were responsible for the development of library and information networks in India are:

- The National Policy on Library & Information Systems Document (1986) accepted by the ministry of HRD, Government of India [7].
- The report on National Policy on University Libraries prepared by the Association of Indian Universities (1987)
- The UGC report on information systems for science and technology under the Department of Science & Industrial Research (DSIR) Government of India has been vigorously promoting an integrated approach to library automation and networking

4.5 Library Networks

The NISSAT agenda for library networks was limited to the development of metropolitan systems, the logic being that libraries and library users in close geographical proximity could effectively utilize a library network. Given this, the goal of information/library networks were to interlink information resources in metropolitan areas such that users could access information irrespective of its location, format, medium, language, etc. Further, the development of such networks requires actions in several areas such as training, rationalization of acquisition of
information resources, diffusion of standards, preparation of union lists, generation of database services apart from setting up hardware, software and communication facilities [13].

Apart from extending support of library networks, NISSAT also extended support for training, and common facilities like development of standards, preparation of union catalogues, data conversion and so on.

**Table 4.3 Library Networks in India supported by NISSAT**

<table>
<thead>
<tr>
<th>Network</th>
<th>Host Site</th>
<th>Management</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADINET</strong></td>
<td>INFLIBNET, Gujarat Univ. Campus, Ahmedabad</td>
<td>Society drawing support from INFLIBNET</td>
<td>1994</td>
</tr>
<tr>
<td><strong>BONET</strong></td>
<td>National Centre for Software Technology, Bombay</td>
<td>Institutional Project</td>
<td>1994</td>
</tr>
<tr>
<td><strong>CALIBNET</strong></td>
<td>Regional Computer Centre, Jadavpur Univ. Campus, Calcutta</td>
<td>Society</td>
<td>1992</td>
</tr>
<tr>
<td><strong>DELNET</strong></td>
<td>India International Centre, New Delhi</td>
<td>Society drawing support from IIC</td>
<td>1988</td>
</tr>
<tr>
<td><strong>MYLIBNET</strong></td>
<td>CFTRI, Mysore</td>
<td>Institutional Project</td>
<td>1994</td>
</tr>
<tr>
<td><strong>PUNENET</strong></td>
<td>Bio-Informatics Centre, Pune Univ., C-DAC and NCL, Pune</td>
<td>Institutional Project</td>
<td>1992</td>
</tr>
</tbody>
</table>

Network activities like creation of OPAC bases, document delivery service facilities, inter library loan local couriers (ILL), current awareness services (CAS), rationalization of periodicals acquisition, creation of union lists of current subscriptions were taken up. With changed IT options, E-Mail, Remote login/ftp, Internet access services are offered to the participants. Network services centres also provide online and CD-ROM based search services [2].
Technology Information Facilitation Programme

NISSAT was closed as a programme about three years back. Now, its role has been taken over by the Technology Information Facilitation (TIF) Programme of DSIR. The specific objectives of TIF programme are to:

- develop appropriate indigenous information capacities to support the R&D activities,
- support the production of local content and promote use of indigenous knowledge,
- promote information and knowledge networking at local, regional and national levels to facilitate flow and sharing of information resources,
- map the national S & T productivity in relation to the international trend,
- support education, training and R & D in digital content development and utilization, and
- promote national and international cooperation in related areas.

4.6 International Database Development Activities- India’s Participation

India has all along been a keen participant in international initiatives, especially those promoted by the UN System. Besides being active in promoting the UNISIST/ASTINFO concepts in the information area, India’s role has been significant in INFOTERRA/UNEP, AGRIS/FAO, INIS/IAEA and APINMAP/UNESCO. India has also been active in networks like TIPS and database ventures like FST A. In all such cases, India gets the international compilation free in
lieu of the inputs provided by the country [5]. Some of the examples of the international activities are given below:

**AGRIS**

The Agricultural Research Information Centre (ARIC) of Indian Council of Agricultural Research (ICAR) has been the national input centre for AGRIS. During 2004-2005, ARIC as a national input centre has indexed 3500 bibliographic inputs from Indian Agricultural Periodicals and submitted to FAO for inclusion to AGRIS database.

**INIS**

In 1970, the Bhabha Atomic Research Centre (BARC) started INIS operations in India. Initially the inputs were sent in worksheets, and now these are being sent in optical character recognition mode. India was associated with INIS from its formative stage itself and started contributing records to the database beginning with first issue of INIS Atom index in May 1970. The INIS sources nearly 12,000 journals, books, proceedings of conferences and seminars, patents and dissertations published in different languages throughout the world. It benefits all those who are interested in the peaceful applications of nuclear science and technology.

Through the sustained efforts during the last few years it has been possible to improve the timeliness and the quality of input of INIS records from India. At present India is at par with or even better than most of the developed countries in these aspects. The number of records inputted by India to the INIS database since 1970 is given in Fig. 4.1.
Fig 4.1: Year-wise input to INIS from India (* upto September 1999)

Fig. 4.2 gives a schematic representation of subject wise input from India and it can be seen that the major contribution from India is in the area of Physics closely followed by Chemistry, Materials and Earth Sciences.

Table-4.4 represents input from some of the developed and developing countries to INIS during the last five years. It can be seen from the table that whereas there is a marked decrease in inputting from United States and United Kingdom,
South Asian countries including India maintained a steady input or considerably increased their contribution to INIS.

Table 4.4 Comparison of Indian input with some of the developed & developing member countries to INIS from 1994 onwards.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITED STATES</td>
<td>17422</td>
<td>28850</td>
<td>30212</td>
<td>23873</td>
<td>12075</td>
<td>9848</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>5579</td>
<td>3640</td>
<td>3040</td>
<td>4385</td>
<td>1440</td>
<td>453</td>
</tr>
<tr>
<td>JAPAN</td>
<td>5046</td>
<td>4285</td>
<td>5579</td>
<td>5910</td>
<td>5859</td>
<td>4110</td>
</tr>
<tr>
<td>CHINA</td>
<td>2500</td>
<td>2524</td>
<td>3155</td>
<td>3028</td>
<td>3411</td>
<td>2300</td>
</tr>
<tr>
<td>INDIA</td>
<td>1610</td>
<td>1682</td>
<td>1845</td>
<td>1841</td>
<td>1744</td>
<td>1111</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>111</td>
<td>278</td>
<td>205</td>
<td>236</td>
<td>347</td>
<td>68</td>
</tr>
<tr>
<td>BANGLADESH</td>
<td>1</td>
<td>1</td>
<td>19</td>
<td>15</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>SRI LANKA</td>
<td>16</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>OTHERS</td>
<td>44922</td>
<td>41060</td>
<td>36997</td>
<td>42106</td>
<td>43107</td>
<td>25221</td>
</tr>
<tr>
<td>TOTAL INIS RECORDS</td>
<td>77107</td>
<td>79021</td>
<td>80854</td>
<td>80899</td>
<td>67994</td>
<td>43125</td>
</tr>
</tbody>
</table>

FSTA

The collaboration between the International Food Information Service (IFIS), UK and the Central Food Technology Research Institute (CFTRI). Mysore is one of the success stories of participation of an Indian Institution in an international venture namely compilation of the Food Science and Technology Abstracts (FSTA) database. As per the agreement, CFTRI scans about 50 Indian periodicals and transmits twice a month (about 400 items annually) to the database. The numbers may appear to be small compared to the coverage of about 1,500 periodicals and 18,000 items by FSTA. However, the collaboration resulted in an increase of FSTA coverage of Indian materials from 35 periodicals to 50. The time lag between publication of the primary material and its appearance in the abstract form in FSTA was reduced from 4-28 months in pre-collaboration period to 5-14 months in the post-collaboration period.
4.6.1 Implications of Participation in International Ventures

International collaborations help both the database generators and input providers in the following ways:-

Benefits Accrued to Database Generators

- Decentralization of input preparation reduces the lead time between primary publications and production of secondary materials (for example, FSTA).

- It helps in overcoming the local language barriers and also in understanding the concepts, which may be local in nature (for example, AGRIS, INIS etc.).

- It obviates the need to build up primary collections and required infrastructure for abstracting, indexing and computer handling at the central processing unit (for example, INIS, AGRIS, etc.).

  - It promotes better dissemination of information at the local level (for example, INIS).

Benefits Accrued to Input Suppliers

- Involvement in international ventures helps in standardizing the data compilation efforts at the local level (for example, AGRIS).

Such collaborations may also involve transfer of software for input preparation, local processing and information retrieval and related information technology (for example, INFOTERRA and INIS).

Acquisition of international compilation in lieu of inputs implies savings of cash expenditure more often in terms of hard currency (for example, FSTA).
Association with international activities may eventually lead to development of comprehensive information system at the local level (for example, the Indian National Focal point for INFOTERRA piloted the establishment of the ENVIS).

It is therefore, desirable that potential Indian database producers seek involvement in international activities more aggressively. From the few example of collaboration so far, one could conclude that adequate skills exist in India to undertake such tasks in terms equal to their counterparts in the developed countries.

4.7 Online Access to Databases in India

It would not be economically viable and operationally feasible to get all required databases on magnetic or optical media into the country. At the same time, it is necessary to bring up information support services to the scientists and technologists in India at par with those available to their counterparts in the developed countries. The user community in India would need facilities on permanent basis to access datacenters like DIALOG, ESA and ORBIT.

ESA Experiments

Demonstration of online searching of the ESA/IRS databases were arranged by NISSAT at Bombay in 1976 and at New Delhi and Bangalore in 1981.

Another experiment was conducted by NAL and NISSAT in 1979-80 to search the ESA/IRS databases offline from Bangalore to Paris and online from Paris to Frascati. The search results were received at Bangalore offline. NAL later worked out an arrangement with IRS DIALTECH for offline searches during 1982-86. Subsequently, in June 1986. NAL with support from agencies like NISSAT, Defence Research and Development Organization (DRDO), CSIR, Aeronautical Development Agency (ADA) and UNESCO set up a 2400 bps dedicated communication link from
NAL to Bombay over the national microwave circuit and from Bombay to Rome via INTELSAT for conducting online searches of ESA/IRS databases for Indian users on a regular basis. The average connect time per day was 2.25 hours under conditions of no line breaks. About 520 databases used one time or the other, demand on NTIS (315), COMPENDEX (313), INSPECT (105), CHEMABS(80) and MEADEX(32) ranked the highest. The facility was discontinued in March 1988.

Besides NAL, several other institutions like NCL, Pune; Regional Research Laboratory, Trivandrum; DESIDOC, Delhi used normal telex lines to access systems like DIALOG and STN in 1989. A private enterprise in Bangalore, Informatics (India) Pvt. Ltd. been provided search services based on DIALOG.

**NACIDs**

Since the cost of a dedicated international telecommunication line was exorbitantly high (about Rs.2.5 million per annum), NISSAT decided to promote dial-up mode online searching. Towards this, five NISSAT Access Centres to International Datacentres (NACID) were set up at NISCAIR, New Delhi, NCL, Pune, NAL Bangalore, CLRI, Madras, and Indian Association for Cultivation of Science (IACS), Calcutta. The NACIDs used normal PSTN lines with ISD facility to go through INDONET of CMC Limited, and the international gateway set up by Videsh Sanchar Nigam Limited at Bombay to avail the packet-switching facility. The centers had telex lines with message communication terminals (MCT) at standby.

The NACIDs were expected to serve the users of the respective regions. These centers had appropriately trained intermediaries to assist the users at site or to conduct searches for absentee users. During the initial stages, NACID recovered only the databases and computer costs (about one third of total cost of a search) from
users. To start with, NACIDs accessed only DIALOG, but subsequently covered other services also. Besides retrospective custom searches, the centers provided SDI services also on such databases for which the demand is not sufficient to justify their installation on Indian networks.

4.8 Networks And Their Development

The scenario of telecommunications in India was changed since last ten years. Now the services offer voice, data and video services through a mix of satellite links, microwave links and fiber optic cables in high capacity range, and satellite links, coaxial cables, radio links and wire lines in low capacity range [8].

National Telecom Mission

To stimulate the change, a National Telecom Mission was conceived with the following objectives:

- To improve overall telecom availability, accessibility, reliability and services of the present network using existing resources, marginal investments, improved productivity and improved customer interface;

- To provide basic satisfactory telecom (voice and non-voice) services nationwide to government, business institutions, urban, suburban and rural areas;

- To integrate overall telecom development with other national modernization programme;

- To build necessary infrastructure for a single national telematics network to incorporate needs for voice/data of all other sectors of the economy;

- To digitalize India's telecom network for future ISDN services with digital switching, digital transmission, voice/data/ISDN, CCITT 7 signaling;
• To automate and offer new enhanced voice and data services like; call waiting, automatic ring back, voice mail, teleconferencing, data communications, electronic mail/fascimile, videotext/tele-text and mobile telephones;

• To reduce lost/mishandled/cross-connect calls;

• To improve international, telecom equipment and services;

• To provide direct dialing to all major cities and other countries from villages; and

• To increase public education, participation and awareness related to telecom developments and its role in the national building process.

Prior to the formation of National Telecom Commission, several long-range initiatives were taken by various organizations and these may be classified into three categories:

i. General data/information network service facilities
   NICNET, INDONET, VIKRAM,

ii. Specialized networks
    BTISNET, CALIBNET, DELNET,
    INFLIBNET, ERNET, VIDYANET

iii. Specialized networks carrying by and large business data/Information
    SAILNET, BANKNET, COALNET,
    RAILNET, TOURNET, etc.

As the second and third category of networks are not relevant to this study, only first category of networks has been discussed:-
General Data/information Network Services

NICNET

The development of this network was piloted by the National Informatics Centre, which was then functioning under the Department of Electronics, Government of India. The primary objective of the network is to provide computing and communication infrastructure to aid planning and monitoring of schemes and decision-making activities in the government.

In the first phase, NICNET comprised intra-city network connecting computers and interactive terminals with a cyber 170/730 system. The facilities that such a network could offer were demonstrated during the Asian Games 1982, and the Non-Aligned Meet (NAM) New Delhi, 1984.

NICNET facility has been established in all Central Government Departments, 35 States/UTs and about 600 District centers to facilitate informatics development for decision support and information exchange. A high speed NICNET National info-Highway, an incremental overlay over the existing network had been setup with SCPC, FTDMA, TDMA VSATs, DVB Broadband, VSAT technology and Wireless WAN to take advantage of Internet technology in India [9].

INDONET

ITES (formerly called INDONET) offers different services integrated in a single delivery mechanism to end-users. It has been used for a number of well-known projects dealing with education, examinations, libraries and electoral cards.

It is a powerful Internet service provider focused on providing business-to-business (B2B) e-Commerce solutions, specifically in the area of electronic data
interchange (EDI). INDONET was India's first data network, which CMC set up years ago, in the late 1980s, based on IBM's SNA network.

Built on the universal web protocol TCP / IP (it also supports X.25 for specific requirements), ITES is connected by redundant high-speed leased lines and powered by the latest UNIX servers at each of its nodes.

A value-added service provider, it deals in optical mark recognition (OMR) and intelligent character recognition (ICR) based on processing services, document management services, file transfer and data management services, managed networks services, facilities management, electronic data interchange (EDI) services, web design and hosting services as well as smartcard and biometric security solutions.

VIKRAM

VIKRAM is the packet-switched public data network under development by Department of Telecommunications, Government of India. **Switched Public Data Network - VIKRAM** commissioned in 1989 at major locations of the country (Delhi, Mumbai and Bangalore). This was setup primarily to provide data services and understand the requirements of the customers. The growth of data customers and the demand for packet data services led to the commissioning of an institutional Network (I-Net) incidentally coinciding with Indian Network covering 8 cities. This I-Net was implemented in a phased manner. I-Net Phase-I covered 8 nodes expanded to 10 nodes. I-Net Phase-II was implemented covering 103 nodes in the country.

**Bibliographic Applications on General Data Networks**

All the general data networks have taken interest in bibliographic applications. NIC tied up with ICMR to offer services on MEDLARS databases and several others on CD-ROM. NISSAT also worked with NICNET to mount Chemical
Both NICNET and INDONET took exercises to put the NUCSSI databases online. In yet another venture, INDONET collaborated with NISCAIR and the NISSAT center at CMTI, Bangalore to create facilities for SDI and retrospective search services on COMPENDEX. Besides providing communication facilities for the NACIDs, INDONET acquired one large computer system to run a few oft-used commercial databases.

**Specialized Information Networks**

**BITSNET**

Recognizing the importance of information technology for pursuing advanced research in modern biology and biotechnology, a bio-informatics programme envisaged as a distributed database and network organization, was launched during 1986-87. The programme has become a very successful vehicle for transfer and exchange of information, scientific knowledge technology packages and references in the country. Ten distributed information centre and an apex centre at the Department of Biotechnology and 46 sub-distributed information centre located in universities and research institutes of national importance are fully engaged in this task.

The entire network has emerged as a very sophisticated scientific infrastructure for bio informatics involving state of the art computational and communication facilities. The computer communication network linking all the centres is playing a vital role in the success of the bio informatics programme.

R & D activities in bio-informatics, human resources development and a variety of services in support of biotechnology, has made this programme very popular and useful to scientific community. The contribution made by the scientists
and academicians at the university department of the UGC and national labs and institutions of the CSIR and ICAR in which bio informatics centres are located have resulted in excellent capacity building for use of a variety of information resources on the internet. More than 100 databases dealing with different fields and of relevance to R & D effort in biotechnology are now available on the network.

**CALIBNET and DELNET**

NISSAT took initiative for the development of these networks to ensure better utilization of S&T information resources available in libraries through resource sharing, to moderate functional load of information centre management and to take care of motivational factors to a large extent by better means of communication.

CALIBNET was envisaged as a metropolitan network linking of 38 libraries in the Calcutta metropolitan area. The applications to be supported are: electronic mail, file transfer, remote log-on and database and document access.

Within individual libraries, the functions to be automated are cataloguing, serials control, acquisition and fund accounting; circulation and local user services. The networking provides of current awareness, SDI, union catalogues, partial databases, and accessing of national and international networks.

Each participant library collects, process and hold information on local computers, which are connected with one another through X.25 packet-switched network. One of the network participants -network service center is responsible for global (i.e., within the network) user service and also act as the network control center. Standardization was based on UNIX operating system.

The implementation was divided into two phases. In the first phase, all institution within the JadHAVpur University cluster and some nodes of Razabazar
cluster such the Department of Radio Physics, Bose Institute and Saha Institute of Nuclear Physics was included. In the second phase, the other libraries, such as the Ballygunge Science College, medical libraries, National Library and ISI were brought in.

On similar lines, the establishment of DELNET was conceived for about 30 libraries in Delhi, which now has more than 1000 participating libraries in India and in some other countries and is actively involved in producing number of databases.

**CSIRNET**

CSIR set up a computer communication network (CSIRNET) for exchange of information among its 40 laboratories. The feasibility study for the CSIRNET undertook by the National Centre for Software Technology (NCST) Bombay which was completed by mid-1989.

The objective of CSIRNET is to help organizing indigenous online database services on such subjects as leather technology, food technology, natural products, chemistry, radio physics and medicinal plants. It provided a bulletin board and set up teleconferencing facilities through the network apart from facilitating flow of routine administrative financial information and exchange of library resources. Apart from accessing international databases through NACIDs, efforts were made to develop databases on the expertise and sophisticated instruments available in the various CSIR units which are of interest to users outside it also.

**DESINET**

DESINET was proposed as a bibliographic information network for Defence, covering only unclassified scientific and technical information. The users of DESINET would be scientific, research and Defence personnel from the Department of Defence,
Department of Defence R&D, and Department of Defence Production & Supplies.

The Defence bibliographic information network will also have close links with other similar networks like NICNET for exchange of information on mutually agreed terms.

DESIDOC will take the initiative in planning and implementing the DESINET as a partially distributed network.

**ERNET**

ERNET is a computer network for academic and research community in India. Starting with eight leading institution -the IITs (5), IISt, NCST and DOE-ERNET now has reached to hundreds of academic/research institutions covering a number of science and engineering disciplines. Campus-wide LANs (conforming to IEEE &12.3 standard) are set up and a backbone satellite based wide area network {WAN) has been implemented.

The network provides the high-speed Internet facility to academic institutions by which various databases available through UGC-INFONET can be accessed

**INFLIBNET**

INFLIBNET is a major national effort to improve information transfer and access, as a support to scholarship, learning, research and academic pursuits. It has linked up institutions of higher learning covering all disciplines, R&D institutions and national organizations like CSIR, ICAR, DRDO, ICMR, ICSSR, etc.

It is a multiple function/service network in the sense that it offers catalogue-based services, database services, document supply services, collection development and communication-based services.
It is a national centre for managing, overseeing and coordinating the network administration and four regional centres which maintained regional union catalogues apart from databases on projects’ institutions and specialists.

At the sectoral level, UGC's Information Centres and NISSAT Sectoral Centres or those performing national level functions/services in specific subjects/disciplines/missions are included. End-users are served locally through the information centres of the respective colleges, departments, universities or R&D institutions. In all, there are more than 150 university libraries, 50 post-graduate centres/ autonomous colleges, and 200 libraries of R&D institutions/centres of national importance outside the university system.

INFLIBNET is a hybrid version of satellite and terrestrial network communication system with a star configuration for interconnectivity of the nodes. Inbound carrier to the central hub will be through Satellite and use the 'slotted aloha' technique; while outbound carrier from the central hub to the nodes used satellite and time division multiple access (TDMA).

**VIDYANET**

VIDYANET is a dedicated communication/computer network to meet the needs of scientists and research workers in the laboratories/institutions of excellence in the country. The first phase of VIDYANET linked up about ten institutions such as All India Institute of Medical Sciences, Indian Agricultural Research Institute, IITs, Indian Statistical Institute, and National Physical Laboratory in New Delhi and Baba Atomic Research Centre, Indian Institute of Geomagnetism, National Centre for Software Technology, and Tata Institute of Fundamental Research in Bombay.
Subsequent phases of networking have covered dedicated institutions in Ahmedabad, Bangalore, Bhopal, Calcutta and Madras.

It linked up institutional computers (Cyber, VAX, DEC, etc.) via telecommunication lines and provided its users like transfer of files of any type - data, programs and documents - electronic mail, exchange of immediate messages, access to remote applications, databases and libraries.

A major VIDYANET objective is to stimulate cooperative research, day-to-day exchange of research information and to execute joint projects and publications. It also allows users to develop databases on specialized areas like biotechnology, superconductivity and supernova research. Besides this, the network aims at providing rapid means of communication by linking computers at various institutions in India and abroad with similar networks like EARN (European Academic Research Network, Geneva) and BITNET through a gateway.
Reference Cited


[16] Union Catalogue of Social Science Periodicals and Serials In India
Available at http://www.icssr.org/doc_unioncatalogue.htm.

management systems, Wokingham: Addison-Wesley.

[18] Wealth of India. Available at:
http://www.niscair.res.in/ScienceCommunication.