

Planning an Integrated National Information System for Science and Technology: A Case Study.
(Planning series. 2).

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[Identifies through a systems approach, some of the major aspects of planning of a national information system for science and technology. The objectives, inputs, functional organisation, stresses and strains, environmental factors affecting the system, the built-in features helpful in overcoming the stresses and strains, integration of the plan with the overall socio-economic development plan and the national agency for implementing the plans and programmes, are mentioned. The features of the proposed National Information System for Science and Technology in India are correlated with the factors mentioned above.]

0 Parameters in Planning a National Information System for Science and Technology

01 TREND

The effective utilisation of the knowledge generated in science and technology is recognised as essential for socio-economic development (1, 4, 5, 8). Therefore, in many countries the federal and state governments, their agencies, and other autonomous bodies concerned with socio-economic development are recognising or establishing almost anew information networks for science and technology. Increasingly national plans for promoting socio-economic development include a plan for the development of science and technology and one for establishing a network of information systems.

02 GUIDELINES

In planning an integrated national information system it would be helpful to formulate and use some guidelines so as to ensure that all the important aspects are taken into consideration and the plan is formulated in a systematic way. The following is a checklist of major parameters or questions to be asked and answers found in examining an existing information infrastructure and/or in planning a new one (3):

1 Government Policy for Information

- A Does the government have a national policy for scientific research and development ?
- B If so, does it have a national policy for science and technological information ?
- C Is there a government agency serving as a focus for information policy formulation ?
- D What percent of the national research and development budget is spent on scientific and technical information ?

11 Manpower Resources

A Existing

- 1 What is the number of trained personnel ? What is the estimated national need ?
- 2 To what extent has their training been indigenous, to what extent outside the country ?

- 3 Are the information and library professions and information specialists in other professions suitably compensated ?
- 4 Are there nationally recognised standards for education and training in the information sciences ?

B Potential for Training Manpower

- 1 What is the capacity of indigenous training institutions ?
- 2 Is there fiscal support for trainees — within or outside the country ?
- 3 Do UN agencies or non-governmental organizations (include private companies) sponsor indigenous training programs ? Fellowships for training overseas ?

III Information Resources and Facilities

A Libraries, Specialised Information and Documentation Centres

- 1 What is the volume, character, and quality of information resources ? Have they been selected in relation to development needs ?
- 2 Are they appropriately distributed geographically in relation to user needs ?
- 3 Have they been adequately organized for use ?
- 4 What types of information services do the Centre provide ? Are they appropriate to the needs ?
- 5 What populations are being served ?
- 6 What is the level of fiscal support given to these institutions ?

B Publication Capabilities

- 1 What is the status of the scientific and technical periodical press ? Book publishing ?
- 2 What abstracting and indexing services exist ?
- 3 What is the status of scientific and technical book imports ?
- 4 What translation capabilities exist in the sciences and technologies ?

C Computer Capabilities

- 1 What resources (hardware, trained manpower) exist?
- 2 What is the overall status of computer application?
- 3 Are proposed tasks significant and large scale enough to justify computer application? Can economies be demonstrated?

IV Institutional Resources

- A What governmental ministries and programs have roles in technology transfer through information?
- B What regional or intergovernmental economic development organizations operate within the country for the same purpose?
- C What non-governmental organizations including scientific and technical societies, have related interests?
- D Do the universities and technical colleges provide services to industry for technology transfer?
- E What role does industry, including multinational companies, play in effecting technology transfer?

03 General Features of System

Having answered the questions mentioned in the previous section, one could use the following checklist as major features/steps in system design (7):

- 1 Overall objectives of the system;
 - 2 The types of inputs forming components of the system;
 - 3 Functions, overall functional organization of the component units and establishing priorities in the action programme;
 - 4 Interlinking of the component units to facilitate their productive use;
 - 5 Environmental factors affecting the performance of the system;
 - 6 Building into the system corrective and adaptive mechanisms to minimize the harmful effects of the environmental factors;
 - 7 Integrated view of the plan in relation to the other plans and programmes and establishing patterns for future development of the system; and
 - 8 Identifying and assigning responsibility to an appropriate body to ensure the proper design, implementation, operation, maintenance and development of the different components of the system.
- In the succeeding sections of this paper the features of the proposed National Information System for Science and Technology for India (NISSAT) outlined in the draft plan (6) are correlated with and viewed in relation to, the general features of a system enumerated above.

1 Objectives of a National Information System**11 GENERAL**

The objectives of a national information system (NIS) may be stated, in general terms, as follows:

- 1 To facilitate the selection, processing and communication of ideas from the point of the generation and availability to their potential users at all levels;
- 2 To ensure that the information made available is precise, exhaustive and accessible with minimum delay, presented in a manner convenient to the respective users, and the service provided at a reasonable cost; and
- 3 To promote the development and use of efficient tools and techniques of information handling.

12 OBJECTIVES OF NISSAT

The objectives of NISSAT manifest in the national information system for science and technology policy. The national information policy is a component of the national policy for science and technology. The latter, in turn, is correlated with the appropriate features of the national policy for socio-economic development.

121 National Information Policy**The National Information Policy**

Seeks to assure that the world's specialised and professional knowledge is adequately utilised in guiding social evolution;

By providing research workers, engineers, technicians, managers, and all those who have a part in scientific activity, planning and management to promote social goals;

Through a plan of action for building a national information network on the existing infra-structure, coordinating the various systems and services, developing the strong points, identifying and correcting weaknesses, and filling the existing gaps,

Supported by public and private sectors, and

Formulating guidelines for assigning areas of responsibility, choice of the means and methods, priorities, financial arrangements and coordinating machinery.

122 Information Policy Goals

The broad information policy goals are:

- 1 Provision of information service relevant to and adequate for meeting present needs and capable of development to meet future needs of the generators, processors, disseminators and users of information;
- 2 Optimum utilisation of existing information services and systems and the development of new ones where and when necessary; and
- 3 Promotion of national and international co-operation and liaison for exchange of information and expertise.

2 Inputs to the System**21 GENERAL**

The inputs forming components of a national information system would normally include the following:

- 1 Sources of Information;
- 2 Users of Information, such as academic and research personnel, technical personnel at all levels, management personnel in all institutions and in the state and national governments;
- 3 Science and technology of information handling;
- 4 Human resources — such as, professional expertise, managerial expertise and other skills — needed in the design, operation and development of the components of the system; and
- 5 Financial resources and other material facilities.

22 INPUT TO NISSAT

The plan for NISSAT mention the following steps in relation to the inputs to the system.

22.1 *Information Resources Development*

- 1 Allocation of responsibility to institutions for building strong collections in specialised subject-fields;
- 2 Ensuring that there is in the country at least one accessible copy of every worthwhile scientific publication for use by specialists, policy makers, etc.;
- 3 Establishment of data-banks for scientific, technical and socio-economic data;
- 4 Establishment of regional depositories for storing materials weeded out from service libraries and information centres; and
- 5 Collection of information about specialists and experts in different subject-fields who may serve as useful sources of information and consultation.

22.2 *Information Users, and Information Services*

- 1 Identification of the present and potential users of science, technology, and management information;
- 2 Creation of information consciousness among science, technology, industrial, business, and management personnel;
- 3 Establishment of a national lending library service;
- 4 Establishment of a national referral centre;
- 5 Provision of translation facilities in various languages;
- 6 Provision of adequate reprography facilities and the promotion of the use of reprograph copies;
- 7 Provision of adequate computer facilities for fast information access and retrieval;
- 8 Establishment of subject-oriented national information grids with adequate communication facilities;
- 9 Cooperation with other national, international organizations engaged in information and/or related type of services; and
- 10 Developing of necessary tools, techniques, and services adequate to meet users' information needs and demands, as these change from time to time at different levels.

22.3 *Manpower Development*

- 1 Building up expertise and provision for education and training for an adequate number of professional personnel of different categories in library science, information science, communication, computer science, reprography, and translation;
- 2 Supporting projects in library science, information science, communication, computer science, etc.;
- 3 Supporting research programmes in library science, information science, communication, computer science, etc.;
- 4 Sponsoring conferences, symposia, seminars, workshops, etc. in library science, information science, communication, computer science, etc.;
- 5 Securing adequate service conditions and status for library and information science personnel.

3 Organization and Functions

3.1 GENERAL

In structuring a NIS, the following are some of the factors to be taken into account:

1 The functions of each of the component units and of the systems designed to satisfy the information needs of scientists, engineers, technologists, industrialists, managers, and other personnel in the country.

The variety of existing information systems and services and selecting the ones to be adapted and developed. The characterization of systems and services may have to be done in a variety of ways. For example:

By Level of Service

- (a) Local information units serving a well-defined, comparatively small clientele.
- (b) State or regional information system serving a less well-defined or less homogenous, but comparatively a larger clientele.
- (c) National information system serving an even more heterogeneous, but comparatively much larger clientele.

By Range of Subject-coverage

- (a) Information service covering a fairly well-defined homogeneous subject or group of subjects with a comparatively small seepage of information — for example, food technology, leather technology.
- (b) Information service covering a fairly well defined homogeneous subjects or group of subjects with a comparatively greater seepage of information — for example, instrumentation, production engineering, agriculture.
- (c) Information service covering a wide range of subjects — for example, physical sciences, medical sciences, behavioural sciences.

By Orientation of Service in Terms of Clientele

- (a) Research and development personnel.
- (b) Research personnel, production and industrial personnel.

- (c) Government.
 - (d) Public at large
 - (e) Combinations of (a) to (d)
- By *Variety of Services Provided*
- (a) Current awareness service
 - (b) Retrospective search service.
 - (c) Abstracting and digest services.
 - (d) Product information service.
 - (e) Data bank
 - (f) State-of-the-art and trend reports, etc.

- By *Access to Information*
- (a) Defined or named clientele only
 - (b) Any person within the system
 - (c) Without any restriction

- By *Sponsorship*
- (a) Government-Central, State etc
 - (b) Semi-government
 - (c) Autonomous body
 - (d) Private benefaction
 - (e) International organization.

Assignment of priority in the development of the different component systems—existing and proposed—in the different phases and stages of implementation of the programme.

32 ORGANIZATION OF NISSAT

321 *Multi-tier Organization*

A multi-tier structure is envisaged for NISSAT

- Level 1: National Information Centres (NC)
- Level 2: Regional Information Centres (RC)
- Level 3: Discipline/Industry-oriented Branch Information Centres (BC)
- Level 4: Local Information Units (LIU)

Examples:

- Level 1: *National Information Centres*
- CSIR — Indian National Scientific Documentation Centre (INSDOC)
 - Publications Directorate
 - National Science Library
 - National Technological Information System*
 - Science Press*
- Atomic Energy Commission
 - BARC Library and Information Service
- Electronics Commission
 - Electronics Information Centre*
- Space Commission
 - Space Information Centre*
- Defence Research and Development Organization
 - DESIDOC
- Indian Council of Agricultural Research
 - National Agricultural Library and Documentation Centre*
- Indian Council of Medical Research and Directorate General of Health Services
 - National Medical Library.

- Ministry of Industrial Development
 - Patent Information Centre*
 - Standards Information Centre
 - Small Enterprises National Documentation Centre (SENDOC)

- Indian Council of Social Science Research (ICSSR)
 - Social Science Documentation Centre

- Other Central Government Ministries and Departments

- Directorate General of Technical Development
- Central Statistical Organization
- Census Bureau
- Etc Etc

- Universities

- University Libraries

- Level 2:

- Regional Centres
- INSDOC Regional Centres
- ICSSR Social Science Documentation Regional Centres

- Level 3: *Discipline/Industry-oriented Branch Information Centres*

- In the National Technological Information System

- Aeronautics
- Food
- Leather
- Rubber
- Pharmaceutical
- Paints
- Fertilizer
- Petrochemicals
- Instruments
- Metallurgy
- Building
- Transport
- Heavy engineering
- Machine tools
- Mining
- etc etc

- Level 4: *Local Information Units*

- For Aeronautics, for example

- Aeronautics Development Establishment
- Hindustan Aeronautics Ltd
- Aeronautics Department, Indian Institute of Science
- Experimental Rocket Launching Station
- Gas Turbine Research Centre.

- *Proposed or under development

322 *Roles and Functions*

National Information Centres.—The NCs are responsible for coordinating, organizing, and providing information service at national level covering a wide range of subjects and national endeavours. These mission-oriented NCs may have the following functions under NISSAT:

- 1 Planning and coordination of activities coming under their jurisdiction.
- 2 Developing and maintaining document collections to service as national base for documentation and information service.
- 3 Promotion of cooperative acquisition of foreign information sources.
- 4 Compilation of national union catalogues of information resources in their respective sectors.

5 Provision of current awareness service of Indian scientific and technological information and of selected foreign information sources either bearing interest to several fields or in fields where BCs do not yet exist.

6 Development and maintenance of data banks, containing data relevant to the activities and to the development of the sector.

7 Providing translation service.

8 Procuring copies of documents on request.

9 Providing reprography facilities.

10 Organizing information dissemination services based on their own information resources and data banks, and by using information services available in machine-readable form.

11 Organizing education and training facilities in documentation information science, computer science, reprography, translation etc.

12 Carrying out and supporting research in documentation, information science, computer science, reprography, translation etc.

13 Providing advisory service to RCs, BCs and LIUs.

14 Developing relations and cooperation with foreign documentation and information centres.

Regional Information Centres.— The main roles and functions of an RC are as follows:

1 To survey the information sources of the region it serves, and to mobilise and organise the information sources and facilities so as to meet the information needs and demands of the region.

2 To compile, maintain, update and publish regional union catalogues of the document resources.

3 To establish and operate a strong reprographic centre and service for the region.

4 To procure, on request, documents from within and outside the region.

Discipline/Industry-oriented Branch Information Centres.— The main roles and functions of a BC include the following kinds of information services:

1 Specialized indexing and abstracting services (including SDI) for current awareness purposes;

2 Retrospective subject bibliographies;

3 Subject union catalogues;

4 Information retrieval and service on request;

5 Information on patents, standards, specifications etc.;

6 Scientific, technical, and economic data service.

7 Preparation of literature surveys, state-of-the-art reports, scientific and technological forecasting, and other types of techno-economic and special management information services;

Local Information Units.— The LIUs are the ultimate recipients of information from the NCs and BCs. A LIU would offer a variety of personalized information services to its immediate clientele from the parent institution. In doing this it would take into consideration the research, development, production, and other work in progress and planned in the parent institution it serves. LIUs also feed BCs and NCs

with information generated in the respective institutions which they serve.

33 PRIORITIES

In the programme for implementation of NISSAT it would not be possible to develop all the components at the same time. The programme will have to be phased out. Therefore, the development of some data bases, projects, and units will have priority over others. This assignment of priority will, in some measure, depend on the priority areas in the plan for science and technology development. The latter priorities will, in a good measure, depend on the priority areas in the plans for socio-economic development. For example, the development of the following components of the information infrastructure may receive relatively more attention in the Fifth Five-Year Plan:

- 1 Natural Resources Information and Data
 - 11 Referral centre for natural resources data and documentation centre for geophysics
 - 12 Regional data banks for natural resources etc in the following areas:
 - (a) Geophysics
 - (b) National water resources
 - (c) Forest resources
 - (d) Ocean resources
 - (e) Oil and natural gas
 - (f) Mineral and coal
 - 13 Information Analysis Centres for
 - (a) Geophysical and geomagnetic information
 - (b) Petroleum exploration information
 - (c) Seismological information
 - (d) Mineral exploration information
 - (e) Water resources information
 - (f) Oceanographic information
 - 2 Meteorological and Atmospheric Sciences
 - (a) Clearing house and documentation centre, including information and data collected through the numerical weather prediction programme and the world weather watch programme.
 - 3 Rural and Urban Development Planning
 - (a) Integrated general information system for planning, including the collection, organization, and dissemination of information on
 - (i) Land use survey data
 - (ii) Material and geotechnical resources
 - (iii) Socio-economic information—such as, housing, transport and communication, utilities, demographic data.
 - 4 Engineering and Industrial Information
 - 41 Documentation and information service centres for
 - (a) Chemical and metallurgical process plant equipment design information, coupled with information analysis centres.
 - (b) Heat and mass transfer data and information analysis centre.
 - (c) Non-ferrous metals information centre.

- (d) Design data centre for wire, cables and related equipment.
 - (e) Joining machinery design data
 - (f) Heat treatment and heat equipment design data.
 - (g) Design and techno-economic information and data bank for machine tools and production technology.
 - (h) Design and techno-economic information on metal cutting, metal forming, and hand tools.
 - (i) Design and techno-economic information on process monitoring and process control instruments.
 - (j) Machinery design information for the polymer industry.
- 42 Construction Information
- (a) Documentation and referral services for building, structures, and environmental design.
 - (b) Regional data centres for building materials and technologies, construction statistics, and construction industry.
- 43 Process technologies

Documentation and information centres to provide scientific and techno-economic information, covering the following technologies:

- (a) Food and food processing
 - (b) Leather technology
 - (c) Pharmaceuticals
 - (d) Textiles
 - (e) Jute
 - (f) Rubber
 - (g) Wool
 - (h) Paints and dyes
- 5 Upgrading the CSIR Complex Information Facilities
- (a) Reorganizing and upgrading of Insdoc to function also as a national referral centre and as a training centre in science and technology information systems.
 - (b) Developing a national technological information analysis and data centre to provide information service and status reports on indigenous technologies developed in the R and D Laboratories in the country.
 - (c) Reorganizing and Upgrading the National Science Library to function also as a national lending library for science and technology.
- 6 National Medical Library
- Developing the resources and facilities of the national medical library including the use of modern information technology.
- 7 Patent Office
- Improving patent search procedures and patent information services.
- 8 Statistical Information

- (a) Developing the information facilities in the Department of Statistics, Government of India
 - (b) Developing the information facilities in the Directorate General of Technical Development for providing information on licensed capacities, foreign collaboration statistics, production levels, etc.
- 9 Promotion and Development of Information Technology: Promoting the design of and developments in
- (a) Microform technology, and reading equipment
 - (b) Other reprography equipment.
- 10 Education and Training in Information Science and Information Technology.
- (a) Raising the information manpower adequate to meet the increasing demands as the planned programmes get implemented.
 - (b) Augmenting the existing courses in information science and developing new specialized courses in the field.
 - (c) Promoting research in library and information science fields.

4 Interlinking and Networking

41 GENERAL

The idea of networking is not new. For example, the provision and development of efficient and effective service to users of information systems through mutual cooperation and coordination of resources — information resources, human resources, and facilities and services — has been in operation, in one manner or other, for decades now. However, with the accelerated growth of information sources, in the number of potential users often located at a distance from the information sources needed by them and in the variety of uses of information, and with the growing realization of the need to use resources economically, the idea of networking is being consciously thought of and planned for.

411 Factors for consideration

Reynolds (9) enumerates some of the factors taken into account in the planning of a network, as follows:

1 Organization structure that provides for fiscal and legal responsibility, planning, and policy formulation. It must require commitment, operational agreement and common purpose.

2 Collaborative development of resources, including provision for cooperative acquisition of rare and research material, and for strengthening local resources for currently used material. The development of multimedia resources is essential.

3 Identification of nodes that provide for designation of role specialization as well as for geographic configuration.

4 Identification of primary patron groups and

provision for assignment of responsibility for Information service to all within the network.

5 Identification of levels of service that provide for basic needs of patron groups as well as special needs, and distribution of each service type among the nodes. There must be provision for "referral" as well as "relay" and for "document" as well as "Information" transfer.

6 Establishment of a bi-directional communication system that provides "Conversational mode" format and is designed to carry the desired message/document load at each level of operation.

7 Common standard message codes that provide for understanding among the nodes on the network.

8 A central bibliographic record that provides for location of needed items within the network.

9 Switching capability that provides for interfacing with other networks and determines the optimum communication path within the network.

10 Selective criteria of network function, that is guidelines of what is to be placed on the network.

11 Evaluation criteria and procedures to provide feedback from users and operators and means for network evaluation and modification to meet specified operational utility.

12 Training programmes to provide instruction to users and operators of the system including policies and procedures.

412 Types of Network

There are different types of network. One type may be more effective and efficient than another for a given purpose. A few network configurations are mentioned below (2, 10). Each dot or circle represents a node (N) — a library, or information centre, or a service point. Each line represents a transactional or communication link (C) between nodes.

Directed Network with six nodes (Fig 1).— The nodes are interlinked through a coordinating or switching centre A. Six communication links ($C = N - 1$) are possible in this pattern. Centralized document processing, a special centre providing referral service, and radial routing of information materials are examples of the directed network idea.

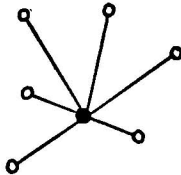


FIG 1

Non-directed Network with six nodes (Fig 2).— Each node is directly linked with all the others.

Fifteen communication links ($C = N \cdot \frac{(N-1)}{2}$), are

possible in his pattern. Interlibrary lending of information materials is an example of non-directed networking.

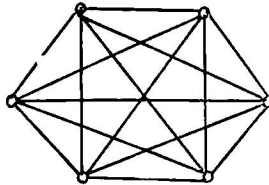


FIG 2

Directed Network Linked to a Specialized Centre (Fig 3).— Six nodes are linked through a coordinating or switching centre A which, in turn, is linked to a specialized centre B. Seven communication links ($C = N - 1$) are possible in this pattern. The specialized centre B may be a referral centre, search centre, or bibliographic centre.

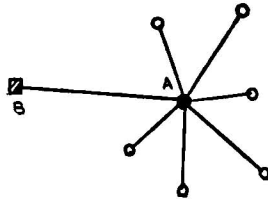


FIG 3

Non-directed Network Linked to a Specialized Centre (Fig 4).— Six nodes are inter-connected among themselves and each of the nodes is also linked to specialized centre A. Altogether twenty-one communication links

($C = N \cdot \frac{(N-1)}{2}$) are possible in this pattern.

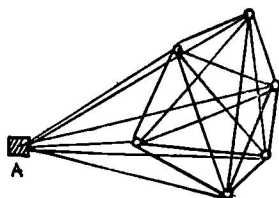


FIG 4

Interlinking of two Directed Networks (Fig 5).— A and B are two directed networks with seven nodes one of which is a coordinating centre. The coordinating centres in the two networks are linked to each other. The total number of communication links ($C = N + 1$) is thirteen in this pattern.

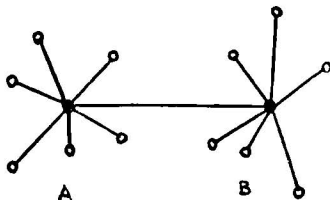


FIG 5

Two Non-directed Networks Interconnected through a Switching Centre (Fig 6).— A and B are two non-directed networks with six nodes each. Each node in each network is connected to one and the same coordinating or switching centre X. The total number of communication links ($C = N \frac{(N-1)}{3}$) is forty-two—twenty-one for A and twenty-one in B—in this pattern.

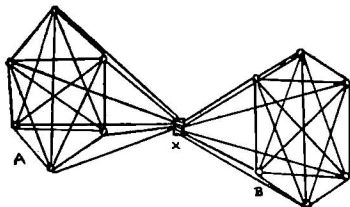


FIG 6

Two Non-directed Networks Interconnected through two Switching Centres (Fig 7).— A and B are two non-directed networks with six nodes each. Each node in A is linked to a coordinating or switching centre X and each node in B is linked to a coordinating or switching centre Y. The centres X and Y are linked to each other. The total number of communication links ($C = \frac{N(N-1)}{3} + 1$) is forty-three in this

pattern. X and Y may be two regional or international switching centres.

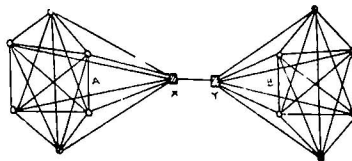


FIG 7

Two Non-directed Network Directly Linked (Fig 8).— A and B are two non-directed networks with three nodes each interlinked among themselves. Each of the nodes in A is linked to each of the nodes in B directly. The total number of communication channels ($C = N(N-1)/2$) is fifteen in this pattern. With six nodes each in A and B, the total number of communication channels will be sixty five.

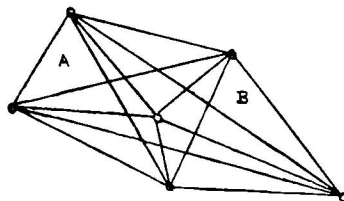


FIG 8

42 Networking in NISSAT

From the outline of the plan for NISSAT—the existing infrastructure and the proposed developments given in the earlier sections of this paper, it will be seen that the plan satisfies most of the criteria for networking mentioned in Sec 41. In Sec 32 and its subdivisions it was indicated that the structure of NISSAT consists of several tiers. Each tier consists of a variety of information centres operating under different auspices (government department, semi-government institutions, autonomous bodies, private bodies)

and providing different kinds of information services to different groups of clientele. There already exists informal and partly formal transactional links among the information centres and services. For example, interlibrary lending among university libraries, among CSIR libraries etc. There are also transactions across these non-directed networks. There are also examples of coordinated or directed networking. For example, document procurement and translation facilities through Indoc, and centralized document procurement and processing in public library systems. As the plan for NISSAT gets implemented, there will be conscious attempts to examine the existing links and reorganize them where necessary, and to develop new networks appropriate to the context so as to achieve cooperation and productivity at all levels and in the different types of work — document selection and acquisition, document processing, information service, information manpower development etc.

5 Factors Affecting System Performance

In a man-made system with interacting components, there will be internal and environmental factors affecting adversely the performance of the components of the system and of the system as a whole. In a national information system, the deficiencies may be due to inadequacies of the system components. For example, inadequacies of

- Information sources
- Manpower and expertise available for operation
- Financial resources
- System planning
- Methodology of implementation of plan
- Action programme.

The environmental factors affecting a national information system include the following:

- Changes in the socio-economic policy of the country
- Changes in the science-technology policy of the country
- Political factors
- Bureaucracy
- Accelerated advances in information technology
- Low level of development of scientific research, production capacities, and managerial capabilities and performances
- Impediments and barriers to the effective and efficient communication of ideas — such as, overabundance of information, accelerated rate of production of information, incidence of redundant and erroneous information, language barrier, information secrecy, cost and delay in the publication, processing, searching, and access to information materials, cultural barriers etc
- Communication facilities available
- Publication activities
- Emergencies and changes of priorities

6 Measures for Adaptation and Development

6I GENERAL

In order to monitor changes and adapt the system to the changing needs and demands, there should be built-in mechanisms sensitive to the internal and environmental factors affecting the system and providing a continuous feedback on system performance. Further, the model which the national information system conforms to should be flexible enough to change but at the same time provide for self-perpetuation of the basic pattern.

The built-in helpful features of the system include the following:

- 1 An explicit statement of the national information policies and goals and the objectives of each information system forming the network.
- 2 Choice of appropriate models for use as guidelines for the design and development of different information systems at different levels.
- 3 Taking steps to promote the effective use of information in research, industry, and government.
- 4 Promoting means and methods of training and orienting users in better use of information systems.
- 5 Establishing means and methods of finding out the information needs of users and the difficulties and problems faced by users in using information systems of various kinds.
- 6 Formulating criteria for evaluating information system performance.

62 PROVISION IN NISSAT

The plan for NISSAT emphasises the need for periodical survey of the information needs and demands of users so as to provide a feed-back to the system designers, managers, and operators. The promotion of the use of information at various levels and the training and orientation of users have also been taken into consideration. The need to augment the facilities for the education and training of information personnel and information users etc has been reiterated. Further, the following have been enumerated as essential prerequisites for developing the infrastructure of NISSAT.

- 1 Good communication facilities linking the users to the network of information centres and inter-linking within the network.
- 2 More effective use of existing telecommunication facilities and developing new communication facilities for efficient operation of the system.
- 3 Support for scientific publication activities, including the establishment of a national science press.
- 4 Information resources (libraries, documentation centres, information analysis centres, data banks etc.) development.
- 5 Facilities for training in library and information sciences, and communication.
- 6 Good organizational system using modern management techniques and financial procedures.
- 7 Standardization in materials, techniques, and patterns of services.

A machinery to ensure continuous inputs into the system, for establishment of priorities, for evaluation and feedback on system development and performance, and to change and adapt the components and the system as a whole according to needs and demands, has been suggested in the form of a Science and Technology Information Agency in the Department of Science and Technology of the Government of India. The Agency is expected to have powers to coordinate the information activities in the country and to implement the national science information programme, including the appropriation of federal funds adequate for the purpose.

It has been recommended that a minimum financial provision of Rs 15 crores be made available during the Fifth Plan Period for the initiation of the recommended NISSAT programme. It has been further recommended that for providing an efficient information service, at least 5 per cent of the total R and D outlay should be earmarked for the purpose.

7 Integrated View

In order to get a proper perspective, it would be helpful to view the plan for a national information system in relation to:

1 The national development plans for other sectors—such as, the education plan, the science technology plan, the industrial development plan, etc.

2 The existing pattern of development of information systems in the country for which the plan is formulated and in other countries.

3 The variety of media available for communication of information and their proper and effective utilization.

4 The mutual impact between information systems on the one hand and the education system, technological developments, research and industrial developments, etc. on the other.

5 The total resources—manpower, money, materials—available for allocation to the development programmes and the targets and priorities established in each of the programmes.

In the plan for NISSAT a perspective is provided by viewing the national science information policy as an integral part of the national science-technology policy; the latter, in turn, being viewed as an integral part of the national socio-economic development plan. Further, the "essential prerequisites" enumerated 6 (See Sec 2) in the plan for NISSAT also emerge

from and lead to, an integrated view of the plan together with an indication of some of the factors affecting the system.

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