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15656



Distr.  
LIMITED

ID/WG.450/4  
16 October 1985

ENGLISH

**United Nations Industrial Development Organization**

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Round Table Discussion of an  
Advisory Group of INTIB Users  
Vienna, Austria, 23-27 September 1985

DEMAND AND TRENDS OF  
INDUSTRIAL AND TECHNOLOGICAL INFORMATION  
IN DEVELOPED AND DEVELOPING COUNTRIES\*

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V.85-32212

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CHAPTER - I

INTRODUCTION

Mankind is now entering a period of transformation from an industrial society to an "information society". Information and knowledge have become the critical new factors in economic growth. While a number of vital resources are vanishing, thereby putting the very infrastructure required for running the basic industries in a precarious situation, we all know that there is one resource which is not only flourishing, but also gaining momentum each day - and that is information. It is now estimated that more than 50% of all information available today has been generated in the last twenty years. Five to ten times more information is available in any given subject area than thirty years ago. Five million scientific and technical articles are published annually in more than 100,000 journals. The world's output of new books is around 1,000 titles per day. It is this fact that has prompted everyone to talk of the information explosion.

One of the greatest challenges facing human society today and in the foreseeable future is the management of change. The chief instrument causing these changes has been advances in technology, backed by

scientific and technological research and development and their applications to produce more goods and services and their cumulative effect on economic and social life of people. These changes have been accelerating with awesome speed for the last few decades with unprecedented advances in communication and information technologies. Sociologists affirm that an information age is being ushered in, in which knowledge/information would be the axial force and determining key factor for policy formulation and material progress.

The needs-and the potential-of the rural and semi-urban masses in the developing countries have been the focus of the U.S. based organisation, viz., Volunteers in Technical Assistance (VITA), for more than 20 years. VITA's staff and 4000 volunteer consultants, many of them from leading businesses and universities round the world have promoted research and development and information exchange on the whole range of technology applicable to small farmers and entrepreneurs in developing countries, including small scale cement plants and improved water wheels, automotive repairs, pedal-power presses and so on. Recently VITA have been concentrating on technology relating to renewable energy - technology that cuts down on the use of scarce firewood and expensive kerosene, the chief energy sources in rural areas of many of the developing countries as well as on technology that uses sun, wind, water and bio-mass. In most developing countries, these energy sources are more competitive with, as well as, more readily available, than imported fossil fuel. But

very few developing countries including India, have any information on VITA's activities, due to lack of communication.

Large trans-national corporations are beginning to find that appropriate technology used in the industrial operations in developing countries can complement their overall turnover. Furthermore, many young, educated and experienced enterprising technocrat-entrepreneurs like Non-Resident-Indians (NRI) abroad, are anxious to integrate advanced technology with appropriate technologies, when it makes sense to do so, and set up industrial units in their home countries to make a decent profit, in the process. They will, thus, be adding to entrepreneurial strength and general productivity which in turn enhances the country's ability to participate in the international economy. Incidentally, they could also help to spread technical awareness and dexterity through the population. But are there adequate and efficient channels for accelerating information to the transnational corporations and to these young entrepreneurs on industrial and technological demand and needs of both the developing and developed countries? The situation in this regard appears to be rather unsatisfactory and much needs to be done. Praiseworthy efforts are being made by the UNIDO in this regard and the Industrial and Technological Information Bank (INTIB) of UNIDO, has been carrying out action oriented activities to facilitate and accelerate greater flow of information to the INTIB users, during the past five years. Furthermore, INTIB has also been assisting in the technology-selection processes, providing information on alternative technologies and capabilities for choice among

alternatives. As for the developing countries themselves, the collection and dissemination of information pertinent to the needs of their countries, especially from the view point of priority within the national strategy is becoming increasingly important for their industrial and technological development. In disseminating the required information, besides the Government of the country, private non-profit, national and regional organisations and associations have to play their own roles. Facilitating information exchanges between scientists and technologists, suppliers and users and between the scientific community and policy makers, should yield great advantage for limited additional resources.

CHAPTER - II

INFORMATION FOR DEVELOPMENT

Folloing the first industrial revolution, economic developments in the advanced countries, have been accompanied by a structural shift in employment from the primary and secondary production sectors to the tertiary or services sector. There has grown a requirement for more and more specialisation and professionalism in the services sector, which has expanded accordingly. Now, information, and the means and techniques of acquiring information and control, are what this sector deals in. Information is itself a "commodity" that provides the basis for the livelihood of an ever increasing proportion of the work-force. Perhaps the most significant contrast that can be drawn between the industrialised countries and the developing countries is between the information-rich and the information-poor communities. Information as a commodity is lacking in the developing countries.

The proposition can therefore be advanced that, although in the course of industrial development in the Third World, the services sector will in any case expand as an automatic accompaniment, nevertheless an accelerated rate of development could be achieved by a primary concentration on the services, or information sector; that is to say, by giving priority to the informatization of this sector. It can be argued



that the services sector is critically important to development and that the information technology application that underpin activities in this sector are appropriate for speeding up socio-economic development in the developing countries.

In recent years, there has been a growing awareness of information as a crucial factor in the progress of the industrialised nations, whatever their social and economic policies and the degree of institutionalisation of communication and information channels. Information is increasingly seen as a major factor for accelerating the development process of countries which should make a relevant utilisation of both the immense fund of already available knowledge and of newly generated knowledge produced locally. The basic problem in the successful application of information towards development is the identification of appropriate information requirements. This involves the identification of actual and potential information users, and that of their specific information needs in the light of the country's development goals and objectives. Information users concerned with development fall into three categories.

Policy makers, planners and managers requiring information for decision-making or for determining priority areas for national development. This type of information is required at all levels of government, in business and industry, in research organisations and academic institutions.

Trained specialists involved in research, development and their application in all fields. They need information to sustain the innovative process which is required to transform decisions on priorities into productive reality.

Much of the rest of the population also requires information for development. For instance, in the developing countries, many of those living in the rural areas, are in need of information about available technologies yet unknown to them, but which could improve their daily lives. The provision of information to the active population will have a long-term effect on the educational level and consequently on the supply of skilled manpower in the developing countries.

It is necessary to determine what types of information and information services are needed for the various kinds of uses and users. Then investigation is needed on how far existing services, including universal services organised abroad, can meet these needs without significant extension or modification.

There should be an efficient information system by which the developing countries are able to identify sources for selecting and collaborating for acquiring the desired industrial technology and product process designs from the developed countries, with great ease and speed. The development of effective information systems in industrial technology has thus become a very important subject for the developing countries, which are endeavouring to modernise their industries, by up-dating the technologies. The importance of

technical information has become even more pronounced with the rapid pace of technological innovations and developments in information processing and communication technologies, which provide highly complex and efficient tools for information analysis, storage, retrieval and communication. There has also been rapid growth of a wide range of information services and capability through various devices and procedures for processing and communicating complex technical data. These developments have taken place and have been utilised mostly in industrialised developed economies in recent years and the continuing developments in this regard are leading to significant transformation in the use and application of information in various fields.

An information system essentially comprises of a combination of various functions, including facilities for collection, analysis of data, its storage and retrieval and its dissemination to users. These functions require institutional and other arrangements, for collecting knowledge from various sources and facilities for dissemination of such knowledge, including document delivery, to various end users. Such facilities can range from complex computerised systems with satellite communications to various media and audio-visual arrangements to libraries and information institutions in metropolitan and rural areas. The coverage of such system must be

open to include an enormous range of subjects, including information on industrial technology, research activities in particular fields, availability of specialised services, description of institutional and technological capability in different areas and the like.

CHAPTER - III

WORLD INFORMATION INDUSTRY

Technology offers a wide range of information and communication resources than people have ever had. The resources are so pervasive and influential that it is now becoming clear that the developed countries are moving into a new era - the information age. One characteristic of the new age stands out among the welter of trends. This is, the increasing emphasis on the production, storage and distribution of information as its major activity.

The United States is the primary incubator of the changes, pushing the world towards an information age. The energies of most of the developing countries are still largely absorbed in farming or early industrialisation. Japan and the advanced nations of Europe are beginning the transition to a new communication and information environment, although they are not yet as deeply involved as the United States is.

The new technologies have profoundly affected governments, business, industry and the consumer. As a corollary and in fact, as the main support, the information industry has become global in scope. Domestic policies concerning computing and communicating have become intertwined with international happenings. Thus, worldwide telecommunications has moved to the top of many national economic, commercial and political agendas.

The growing importance of telecommunications throughout the world is the result of three important forces. (i) Many nations have realised that they cannot compete in the development of the information industries without good telecommunications technology. (ii) The convergence of computer and communication technologies has created the possibility of growth of the information industry internationally, without regard for national boundaries. (iii) Multi-national corporate operations require worldwide round-the-clock communications and global networks for banking, air traffic control, travel reservations, news and trade. Oil producers for example, are highly dependent on communication systems to know where tankers are, when they are scheduled to arrive in port, and what special problems may exist, so that they can allocate their product most efficiently along international networks. In many cases, profits garnered by firms, depend on how effectively they use both communications and transportation.

We can with considerable assurance, forecast the nature of the communications and computer technologies into the 21st century. We can expect increasingly ubiquitous information technology; transmission costs will fall considerably as we apply high speed computing to communications.

Two technologies can be singled out as the driving forces behind the information revolution: viz., the satellite and the semi-conductor "chip". A satellite receives radio signals at one frequency range, amplifies them, and retransmits them at another frequency range, using what is known as

a "transponder". While technological developments in power sources and launch vehicles have contributed greatly to the rapid development of communications satellites, transponder developments have made possible reductions in the cost of transmission over long distances, and today, the gradual encroachment on even local communication costs.

Underlying the rapid worldwide thrust towards digital communications and lower-cost computing, is the dramatic and continuing decline in the cost and price of semiconductor technology, which is based on the silicon integrated circuit or "chip". The number of functions on a chip is increasing by factor of 10, almost every five years. The speed at which these functions perform their tasks is increasing at least twentyfold every 10 years and the cost of the hardware into which these chips go, appears to be falling by at least 100 times every 10 years.

Semiconductors are used for various functions, in processing, as in computers or stored programme switches in the new digital telephone transmission systems; for input/output devices such as terminals, word processors, and telephones; and for memory systems. They are used in small, low-cost consumer products including pocket calculators, in video games and in the "brains" of many new home appliances. Semi-conductor chips are also important to the fuel-efficient operation of the automobile.

In the future, chip technologies will provide better human-machine interaction through improved

displays and better speech recognition and voice synthesis. They will simplify the processing of signals by reducing the number of bits transmitted and thereby lowering the cost of transmission. Finally, they will make the telephone useful and flexible - more "intelligent" - through the provision of new services, including call forwarding, speed dialing, call holding, multi-party conferencing, wake-up calling and alarm calling. Significant reductions in the cost of digital hardware as personal computers, intelligent typewriters, word processors and intelligent telephones are being achieved by producing general-purpose computer/switching circuits and specialising their functions in the software. The significance of these developments to the computer/communications industry is that engineers will design new products under the assumption that the hardware of computer logic is essentially free. Software design costs will increasingly dominate the building of new computer and communication devices. There will be increasing demands for software designers, and more and more software will be prepackaged as firmware.

Telephone carriers throughout the developed world are rapidly moving towards an integrated services digital network, that will provide voice, data, image and video communications from a single terminal. The beginning of this revolution in the telephone service is the "intelligent" telephone. Coupled with the digital private-branch exchanges in the office or stored programme digital switches in the carrier's central office, intelligent telephones are essentially computers with memories that can be programmed to offer a variety of communicating services.



Collectively, the services, products and information that are emerging as a result of the marriage of computers and telecommunications are known as network information services. Network information services can connect the needs and resources of users to the capabilities and services of producers and can facilitate transactions among them. All of the usual services of a marketplace can be offered within a large information network. Products and services can be advertised, buyers and sellers can be located, ordering, billing and delivery services can be facilitated and transactions - including wholesale, retail, brokering and mass distribution - can be consummated. Indeed, the entire range of products and services for business, industry, consumers and government can be perceived as a marketplace - a marketplace on a communication network, in which a single transaction on an intelligent telephone, sets in motion, concurrent and sequential activities (such as adjusting account balances and inventories and scheduling follow-on activities) that do not require human intervention.

Electronic mail networks are growing rapidly and will continue to do so as they become intertwined with private video, audio, and computer conferencing networks. The combination of electronic funds transfer, and electronic mail, makes possible far more efficient means for the management of cash. Firms in international business moving money around the world can monitor the flow of their money data continuously, keep track of payments and expected payments, and transfer money into more profitable channels, thereby ensuring much more efficient money management.

Providing these network services, requires a production facility that can be on a network as well. A large distributed network of computers, software, terminals, and data bases (shopping catalogues, comparative analysis of insurance buys, schedules of aircraft and trains and the like) provides an ideal production facility. New services can be "manufactured" by adding value to existing services; producers can pool resources to achieve economies of scale and suppliers can specialise in processes and products in which they have a competitive edge. There is room for small producer to custom-tailor services to an individual user's specification.

Telecommunication costs are falling so rapidly that it is estimated that by mid-1990s, for every US dollar paid for transmission as much as US dollar 4 will be paid for terminals, software and the information processing required to use that transmission. While the growth of voice communications will continue to increase at a relatively modest rate of about 4 per cent per year, the growth rate of network services will be in the neighbourhood of 50 and even 100 per cent per annum.

The internationalisation of the information industries is inevitable. Trade in media products, films, videos, books, magazines and newspapers has often been the cause of considerable concern to nations seeking to maintain, even establish cultural identity. Data delivered via computer-communication

networks are more difficult to "read" and evaluate. These are the transborder data-flows that transfer technology, exchange money, co-ordinate and manage the activities of foreign subsidiaries and organise people. The volume of information is enormous and its value is difficult to measure.

Computer communication networks know no national boundaries. It is relatively easy to manufacture information on international network production facilities and to market information products and services in the international network marketplace. Nations recognise the importance of this new international industry and are seeking ways to enter it. Some seek tariff or non-tariff protections. The international debate concerning transborder data flow is, in essence, a debate about international trade in telecommunications and information products and services. How a nation develops its strategy for dealing in this new international information trade regime depends on how it views information in its society and this depends on its legal and cultural history.

Information is now a major concern to all advanced nations and of increasing concern to developing countries. Information is necessary for technological and economic growth and for the efficient management of enterprises and even personal affairs. Information has value and is freely and widely available for purchase. In the U.S. view, information is a traded commodity that should not be tariffed and that should be "free to flow" in international markets.

The French see the development of their own information products and services, as well as of the equipment and systems required to produce and distribute them, as being of prime importance to their economic growth. A nation that cannot itself provide the information products necessary for its citizens and industries has lost a good measure of its independence, according to this view.

Brazil takes a view that electronic technologies - communications and computers - provide the industrialising nations with an opportunity to become competitive on more secure, if not equal, footing. Brazilian industrialisation policy seeks the absorption of technology, not merely its transfer. This approach calls for Brazilian businesses to make the kinds of improvement in their new technologies as might be made by similar businesses in industrialised countries.

Almost a decade ago, Japan took a momentous step of making direct government investments in research and development and has since made inroad into the "citadel" of advanced technology viz., the United States.

Indonesia, Thailand, the Philippines, India and the new nations of the Pacific Basin are searching for the means to expand their communication and computing capabilities. India and Indonesia have already launched their own satellites, and Australia would have done so during 1985. The scattered island nations of the Pacific are seeking

the means to communicate with each other as well as with important metropolitan cities of the world like New York, London and Paris.

Modern information technologies and the increased generation and application of technological information, including the development of national primary and secondary services and data, is essential to socio-economic development, together with increased flow of such information from external sources and the possibility of access to foreign sources. Since technical information in industrialised countries will increasingly be available in machine-readable format, its effective utilisation in developing countries may depend largely on the extent to which such format is utilised and also on the selection and preparation of suitable inputs and optimal usage of the outputs from such facilities.

Information policies and strategies in developing countries should therefore take recent developments in information technologies into full account. At the same time, these policies should lead to the development of appropriate information systems, which meet essential requirements for generation, dissemination and application of scientific, technological and industrial information.

The scope of information systems dealing with technical and industrial information varies considerably with the wide range of requirements at country level and in various fields and sectors. Such systems and facilities extend from traditional means of collecting and storing data in non-digital form and disseminating such data through mail services, field demonstrations and the like in most

developing countries, to highly specialised data bases and services, using digital format and satellite communications for high speed and high volume data transfer across national boundaries, mostly in developed countries.

Since the 1970s, the nature and potential of information systems has changed significantly because of the major transformation in most aspects of information technology. Computers, and other information machines are the motor power, pulling us towards a transformed society faster than we can understand where we are going .

## CHAPTER - IV

### INFORMATION NEEDS OF AN INDUSTRIAL SET-UP

Technical information available today is so vast that the success of an industrial firm depends first on its ability to receive the vital information, in time. Information has come to be realised as an important commodity in production along with men, material, money, machinery and methods. Since technological lead of an industry is a measure of time employed for the proper utilisation of information to remain ahead of others, technical information holds the key to the continued prosperity of many industrial units. The basic problem in the successful application of information towards 'technovation' - which is a creative process in financial and technical terms - is the identification of appropriate information requirements. The information needs of entrepreneurs are crucial to the survival of the business. The organisation of information into a Management Information System (MIS) is equally important to both big and small firms.

A well organised documentation and information analysis service can help to improve the technovation process in a Company, whether small or big. The advantages that result from such a service are: shorter innovation process, increased productivity, increased competitiveness, better environment and higher profitability. Especially in an engineering enterprise,

the vital part played by technical information can be assessed by the manner in which technical information has catalysed the growth of the enterprise. The information that led to acquisition of knowledge and expertise in several areas of advanced technology can afford an opportunity to disseminate this knowledge to others, outside the enterprise to enhance their manufacturing operations.

A responsive and effective information service requires adequate information for its own control, growth and adjustment. This concept implies a cultivated understanding of the needs of the users to be served and their reactions to the services provided. It also implies continued monitoring of information handling operations, technical alternatives, costs, etc.,

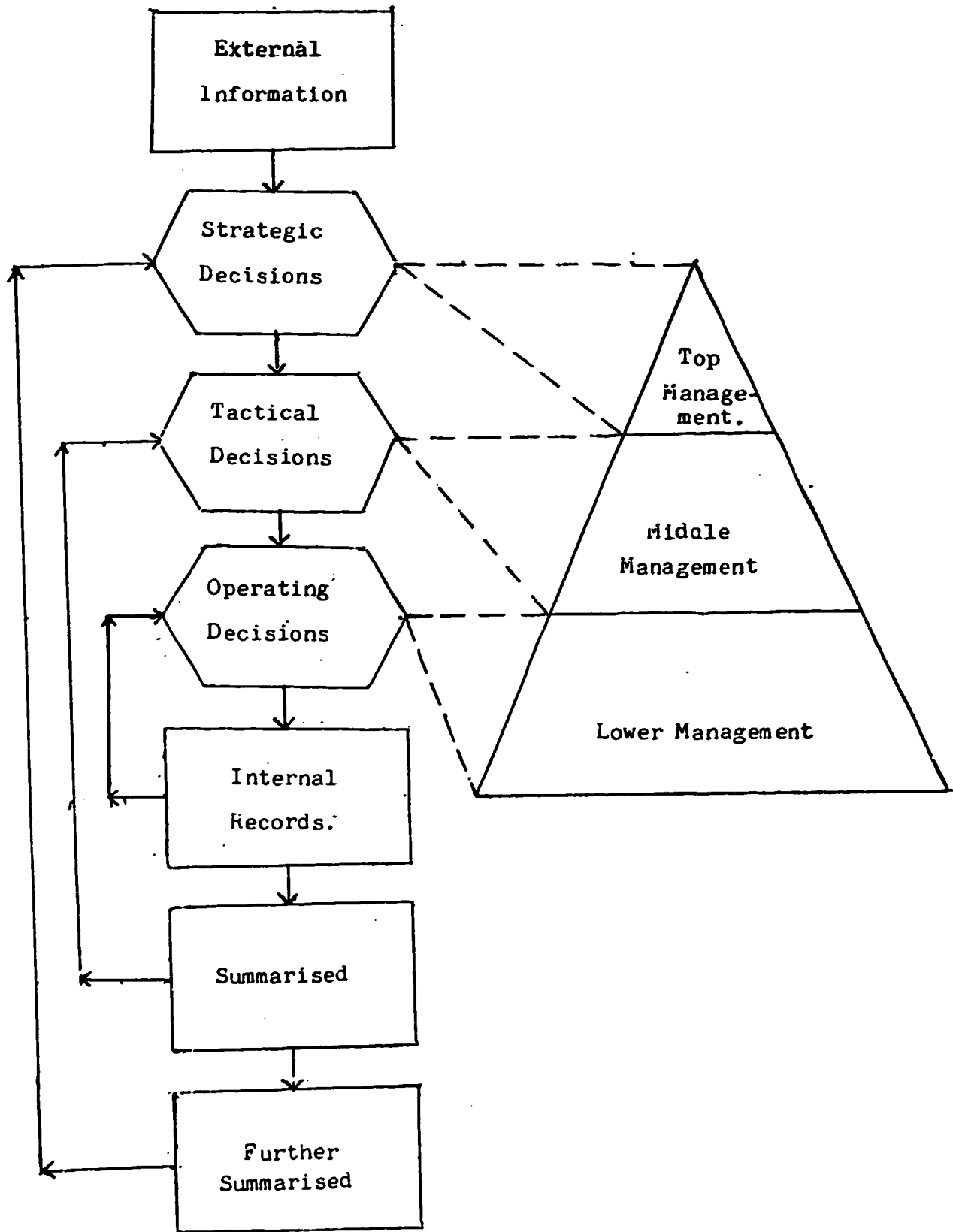
In an ideal situation, the industrial information system is composed of all information elements required by every employee to accomplish his work. Such an information system not only assures technological growth of the Company but also fosters good industrial relations.

The activities of any industrial information system greatly depend on the nature of information flow in the organisation.

A generalised pattern of information flow to support decision making at various levels in any industry is shown in the flow chart on page 22.

Also Table I on pages 23 & 24, shows the various information packages and the variety of end users in a typical industrial organisation.





Information Flow in an Industrial Setup.

**TABLE I : END USERS OF THE INFORMATION SERVICE/PACKAGE**

Information Service/ Package	Contents	Depart- ment	Organi- sation	Ancilla- ry Units	Industry	Society
1 Current Title Service	Bibliographical details of all articles of documents received in the Information Bank	x	x			
2 Bibliography	A comprehensive list of selected documents on a specific topic	x	x	x		
3. Statistical Information Service	Statistical data on the products or processes of interest to the user	x	x		x	
4 Technical notes	A brief account on the technical topic of interest	x	x	x	x	
5 Executive Brief	The information package highlights topics of interest to the organisation	x	x	x	x	x
6 Topical Note	A comprehensive write-up on a specific topic or an event	x	x		x	
7 Management Abstracts	The various management techniques that have relevance to industry	x	x			
8 Product Information Brochure (PIB)	Provides exhaustive information on newly developed products of interest to the organisation	x	x	x	x	
9 Comparative Product Profile (COBP)	A comparative study of the salient features of products or processes of the competitors	x	x		x	
10 Country Profile	Social and techno-economical, political aspects of a country are analysed	x	x		x	x
11 Tech-Alert	Provides Information on emerging technologies by scanning current periodicals	x	x	x		

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12	Technology Link	Latest trends in research & development of a specific technology are analysed	x	x	x	x	x
13	Product Focus	The salient features of products relevant to the industry	x	x	x	x	
14	Nascent Information Service	An alert service for the top executive to keep abreast of the latest economic developments	x	x			
15	Transearch	The technological topics of interest to the organisation are identified by scanning French and German periodicals	x	x	x	x	
16	Patent Information Service	Brings to the notice of the engineers the latest product/processes that are patented	x	x			
17	Write-ups	Information package on any technical or management topic. It is prepared on request or in anticipation	x	x	x	x	
18	Oral and written translation, interpretation	Translations of technical texts from German, French to English. Interpretation service covering French, German and Italian to top management	x	x			
19	Reference Service	Involves answering technical query posed by the user	x	x			
20	Selective Dissemination of Information (SDI)	Matching users profile with the document profile to meet users' needs	x	x			
21	Referral Service	In the absence of the availability in India of information, directing the seeker of information to possible sources	x	x	x	x	
22	Liaison	Establishing contacts with national and international technical institutions/associations for exchange of information	x	x			

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Any industrial information system is likely to be engaged in processing operations that have one or more of the following characteristics :

- (i) a large volume of input data;
- (ii) repetitive tasks;
- (iii) the need for speed in processing and retrieval;
- (iv) the need for a high degree of accuracy;
- (v) processing complexity i.e., complex manipulation of data;
- and (vi) information exchange.

The above characteristics of industrial information system encourage use of computers and micro-processors. Computerised storage of information saves time and increases productivity. Information can be analysed and stored on any of the mass-storage devices (like magnetic tape, magnetic disk) and the same records in a file could be reorganised several times according to the requirement. The computer files can be easily accessible to several people at nearly the same time. The network system will connect two or more departments and they will be able to quickly exchange information.

CHAPTER - V

CURRENT INFORMATION SYSTEMS AND  
FACILITIES IN DEVELOPING COUNTRIES

The existing situation in developing countries in regard to "information systems and facilities" is varying in degrees, however, with underlying common factors viz., most of them do not have any national information policy and national network of information service. The information institutions wherever these exist, are highly fragmented with very little co-ordination between them. Of course, most of them have national Libraries and Central Libraries in towns and cities. Almost all their big cities are endowed with university libraries and in some countries, the U.S. Information Service and the British Council Libraries. The latter two, keep titles emanating mostly from their respective countries. Besides, in some of the more advanced developing countries, facilities exist in scientific & research institutions and laboratories for collection and dissemination of information on a particular discipline e.g., aeronautical research institutes maintain fairly up-to-date literature, journals, articles and monographs related to aeronautics for the use of their staff and for individuals interested in the subject. Such sources also serve the aircraft industry and educational institutions like science and engineering colleges. Besides, industries in the large sector - both in public and private sectors - maintain libraries and documentation services for the use of their own staff, mainly on subjects pertaining to the technology of the products manufactured by individual enterprise.

Broadly, most developing countries can be categorised under three different groups in terms of the extent of information activities and facilities, they possess. In the first group, which comprises of relatively a few more advanced developing countries, have well defined policies regarding information on industrial and technological developments and possess satisfactory institutional and other facilities for information processing, including documentation and communications. However, institutional co-ordination even in these countries is generally inadequate and although a collection of periodicals is maintained in some institutions, the majority of such collections are fragmentary. In some of these countries, list of periodicals is maintained at national information centres together with the documentary delivery system. Public abstracts are generally available in some of the institutions. However, they lack modern facilities of collection, storing and retrieval of information like computer facilities, and access to foreign data basis is limited. Several other aspects of information systems require considerable strengthening such as the need for a much large collection of books and monographs, greater access to latest publications, specialised training facilities for informational personnel, greater dissemination of information, documentation deliveries to particularly non-metropolitan users and greater co-ordination of information functions and institutions. One important aspect which needs to be strengthened in these countries is to provide incentives and facilities for greater utilisation of industrial and technical information by user groups including repackaging of such information in suitable form and language in which it can be effectively utilised.

The second group consists of those countries where information systems and facilities exist only in certain selected sectors of industry and economy, apart from the existence of basic institutional facilities such as in university and central libraries, in individual enterprises and in documentation and research institutions, with fairly satisfactory information, documentation and dissemination mechanism. However, there is no national network of information systems, neither there exists any information policy at national level. Well-defined collection and dissemination of technical and industrial information are fragmentary and limited. The collection of books, periodicals and monographs is generally poor and these countries experience difficulties in acquiring new titles. Computer facilities for acquiring industrial, technological and scientific information are poor and can rarely be used for on-line searches of external data basis. Telecommunication systems are inadequate for interlinking information systems in different parts of the countries. In addition, there is serious shortage of skilled personnel in processing and for implementation of information techniques. Facilities for research in science and technology are lacking in most of these countries and if available, are restricted only to a few sectors. Only a few periodicals are available in complete collection and document delivery systems are restricted to only a few areas.

In the third group of developing countries, who form unfortunately a large majority, there is

barely any information activities on science, technology and industry, or wherever these exist, are at very low level in terms of capability and usage. In these countries, there is very little awareness of the importance at the users level of technical information. Demand for and use of such information has not developed and there appears to be very little effort made in order to improve the situation. Collection of books, periodicals and monographs is very limited and generally out of date with hardly any new titles in various fields. Computer facilities for information processing do not exist and there are only a few skilled personnel available for handling technical and industrial information. Generally, in this group of developing countries, information system and the required infrastructural facilities are extremely inadequate.



## CHAPTER - VI

### GROWTH OF INFORMATION TECHNOLOGY IN INDIA

In order to assess the role of information services and the impact of information technology for the growth of industrial development, it is essential to make a very brief review of the birth and growth of industries in India. It was only after the Second World War, a concerted effort was made to transform an agrarian economy into an industrial economy. An organised creation of industrial activity in India is therefore hardly four decades old.

The industrial information service in India has adapted itself to provide useful information to serve the cause of industrial development of the country. The actual industrialisation can be deemed to have started after India attained independence in 1947. The initial post-independence years were characterised by the creation of industries with technical know-how obtained from abroad. Most of the information needs at this stage were provided by the collaborators whose products were introduced into the Indian market through licence manufacture. Hence the products, processes and even relevant industrial information were fully imported. The real change came about with the generation of indigenous know-how as a result of domestic R&D efforts. It was at this stage that the industrial

information service was recognised as an important constituent of industrial development of the country. The birth of most of the engineering industries in India through foreign collaboration and their subsequent growth due to their own capacity to provide the required know-how is the general pattern. The information needs have changed from the stage of collaboration to the stage of indigenous production.

Access to precise and reliable information - scientific, technological, commercial and managerial - at the right time in a form most conveniently usable can help to arrive at quick decisions, measure performance, take remedial action and plan for the future, in addition to minimising the wastage of resources due to unnecessary and unintended re-invention. Further, the availability of the right type of information can trigger new directions in research, development and managerial action.

Electronic computers were introduced in India just about two decades ago. Until recently, developments for the extensive use of sophisticated computer technology in data and information processing have been comparatively slow and sporadic.

The computer centre of the Indian Institute of Technology, Madras, is used for implementing the CAN/SDI experimental project, in operating the Police Information System for the Tamil Nadu

Government, and in other management information system development. An experimental terminal has been installed in Bangalore. The Tata Institute of Fundamental Research (TIFR), Bombay, has an active computer/information research group developed over the past two decades. The computer facility of the Delhi University has been used extensively by the Indian National Scientific Documentation Centre (INSDOC) in preparation of various data bases, indexes, directories etc.,

The Indian Statistical Institute, Calcutta, has been the pioneer in the use of computers and in computer science education. Its division, the Documentation Research and Training Centre, in Bangalore, has been developing programmes and pilot computer-based information storage and retrieval systems, indexing methods and offering courses in the subject as part of its programme of education in documentation and information science.

Some of the industrial information centres such as the Central Technical Information Centre of HMT and Technical Information Centre of BHEL have started using computers for information processing. HMT's Central Technical Information Centre is developing Computer based selective dissemination of information systems mainly for internal analysis.

The Data Bank and Information Division (DBID) of Information Planning and Analysis Group of the Electronics Commission has been maintaining an information base for dissemination of basic data pertaining to indigenous electronics industry. The information is being maintained in a computerised data bank called 'Electronics Industry Information System'. Data, such as directory information, licensing, approvals, production, export, import, foreign collaboration and other macro-level statistics regarding the electronics industry are available with the data bank. The information is being used mainly for internal analysis as well as policy formulation and is also being provided to the entrepreneurs, other Government agencies, and answering Parliament questions. The main functions of the Division are the following:

- (i) Acquisition of Data
- (ii) Organisation of Data
- (iii) Analysis and synthesis of data
- (iv) Updating of data
- (v) Data retrieval and dissemination
- (vi) Feedback and improvements

Bhabha Atomic Research Centre (BARC) at Bombay uses computer for its catalogue of technical reports and other documents. It now serves as the input centre to International Nuclear Information System (INIS) and has developed Information Retrieval System for INIS data base.

National Information System for Science & Technology (NISSAT) - Among other things the NISSAT plan envisages the development and use of computer facilities in bibliographical information processing, data base creation and information transfer and services based on them, in information storage and retrieval, in Selective Dissemination of Services based on international tape services etc., Considerable progress has been made in all these areas.

Policy directions for generating and utilising scientific, technological and social knowledge for socio-economic development of India were succinctly enunciated by the first Prime Minister of India, late Pandit Jawaharlal Nehru in the country's Scientific Policy Resolution (SPR) in 1958. SPR not only stresses the role of science and technology for socio-economic developmental approach, but also places equal emphasis on systematic building up of information/knowledge base and its use. This far-sighted and enlightened policy has resulted in the creation of number of R&D institutions in the last four decades. Alongside these institutions, the information support base has also been built up. Good as these efforts are, as information has now come to occupy the centre of the stage, its care, harnessing and management assume great importance and the evolution of a national information policy now seems to be imperative.

The information infrastructure that India has, comprises mainly libraries, documentation and information centres, a few information analysis centres, centres for scientific data, centre for socio-

economic statistics etc., These institutions have been established at various stages of the country's development, offering library, documentation and information services in a conventional way. Now these institutions have to be integrated to form a national network, identifying their respective individual and collective roles, functions, and responsibilities, with proper linkage and inter-connections, but without any administrative control, and red tape from any one top organisation. With the fast changing dimensions of information, new types of information institutions are bound to be designed and developed. These new types should coalesce with the existing framework smoothly.

Information technology holds the key to the success in establishing an integrated versatile national system. At present, except for the National Information Centre, which is attempting to provide MIS to the Government and a few sporadic attempts at local levels by some institutions, not even beginning has been made to modernise information systems and services at the national level. Bibliographic information, factual and numeric data services, are increasingly becoming computer-based and are commonly available on-line, in most of the developed countries. In the meantime, these services may be available only in the machine readable forms and paper based services are likely to be prohibitively expensive. As heavy importers of information, India's information systems and services would be seriously affected even to hold-on to conventional services as they stand today. And the big problem for the country, which is being tackled by the Government of India on a top priority basis, is

the awfully inadequate tele-communication facilities. Hence the country's National Information Policy directions should include choice of computer hardware - main frame, macros and minis with all supporting systems - development of software indigenously or import of software compatible with the hardware, problems of netting linkages with international data bases etc.,

All these naturally imply that a continuous stream of quality manpower should be made available at all levels of information handling. This is one of the serious lacune at present in India, needing a great deal of attention. The National Information Policy should not only be for setting and offering full-time education and training programmes on crash basis, but also to organise continuing education and training programmes to absorb the existing manpower into the modern mainstream.

Above are only some of the salient issues. But to create an effective mechanism and machinery for providing accessibility and availability to recorded public information, national information network is a minimum requirement. For a fast developing country like India the time is ripe for initiating appropriate actions by all the shareholders, like the Government of India, professional associations, educational institutions, industry and trade etc., to evolve a National Information Policy.

CHAPTER - VII

DEVELOPMENT OF NATIONAL AND GLOBAL  
INFORMATION SYSTEMS FOR DEVELOPING COUNTRIES

In developing any information systems, one should not think in terms of only supply of information but place higher emphasis on the quality of information stored and distributed by the system and the information support with which the system would be equipped. It is the final users of the scientific and technological information, their perceived and unexpressed wants and needs that must be at the centre of attention of any information systems. The differences between the requirements of the users of scientific information on one hand and the industrial and technological information on the other, must also be recognised. Information is not an alternative to action, but on the contrary, an essential element in the decision making process and hence an instrument to allow action with higher probability of success to identify actions and select among them.

The inadequacies of the information institutions and facilities in most developing countries call for an urgent need to improve the prevailing situation in those countries for developing effective and efficient national information systems on industrial and technological front. No doubt any measures for improvement of existing information systems and for creating new facilities and institutions for the purpose, will have to be so designed



that these meet the general and specific requirements in a country's situation. In the first place, objectives of such information systems should be clearly defined in the national information policy. Thereafter, the promotion of demand and usage of scientific and technological information and identification of main user groups in a country, are some of the important aspects to be looked into. Other aspects which need to be covered, include, assessment of the kind of information required and determination of inter-relationships and linkages necessary with scientific and technological information systems in other countries and at the regional and international levels.

In formulating any national information systems and information network, we must recognise that without a close relationship between the demand side representing both existing and potential user requirements, and the supply of scientific and technological information, it is not possible to stimulate and promote increased demand and greater popularisation of information usage. An important function of the national information system should therefore be, the development of socio-economic environment in which scientific, industrial and technological information is required and is utilised to much greater extent than at present.

Role of government in developing countries for establishing and strengthening information

systems and institutions is very important and indeed is pivotal unlike perhaps in the developed countries. It therefore becomes necessary for the governmental agencies in developing countries to assess carefully users' needs and promote user demand especially in the priority areas of special national interest. The user groups include government departments and agencies, educational and research institutions, industry and trade, engineering and consultancy firms, trade and industry associations, development banks, individual entrepreneurs and professionals.

Bibliographical information and linkages with regional and inter-regional networks constitute an important aspect of information systems at the national level. In most developing countries, bibliographic information sources need to be greatly strengthened and national bibliographies should be prepared in each country.

Non-computerised information systems and facilities will continue to be necessary in developing countries, despite the gradual extension of latest information technologies to the developing countries. Books, periodicals, documents relating to science, industry and technology will continue to play a very important part and their acquisition and delivery to end-users will remain an important function of information systems in these countries.

It must be appreciated that no uniform model of information policies or systems can be presented .

which could be suitable for all developing countries. Hence there is need for considerable flexibility in the development of information systems and institutions and these should be capable of adjustment to changes in country situations and the level of development. A review of existing information services and facilities in each developing country should be undertaken and an assessment made of the extent and manner in which existing information services at national level are, in fact, being utilised.

The development of effective national information systems on science and industrial technology in developing countries and the financial and the technological constraints faced by most of these countries, especially in the introduction and use of latest information technology, necessitates greater international co-operation between developed and developing countries and the implementation of programmes of multi-lateral and bilateral technical assistance for this purpose. Technical assistance programmes should cover selection of equipment, development of software and implementation of specialised training programmes for local personnel, besides linkage arrangements at inter-country and international levels.

The establishment of global network of information is an evolutionary process requiring several years of concerted efforts from the national governments, regional inter-governmental organisations and the UN system as well as the international scientific and technological community at large. Considerable progress

has been achieved by the industrially advanced countries in developing international information systems over the last three decades and these have different purposes in terms of subject and functional coverage as well as information and communication structures, and management strategies. Despite such vast volume and diversity of information sources, developing countries find it difficult to make effective use of them. This situation could be improved by adopting the following measures:

(1) First and foremost is to strengthen the existing national information systems on scientific and industrial technology in the developing countries.

(2) Activise the source referral function of the network globally and using the existing services facilities at the international level, expand the coverage based on demand requirements and availability of resources.

The development of global network of information at the national and international levels, depends essentially on the commitment of the respective governments of the developing countries and subject to this, following measures could perhaps assist the countries to develop their information networks :

(i) Activise the scientific and technological source - referral system, at the national, regional and global levels;

(ii) Establish an effective method of co-operation among organisations and agencies to achieve integration of different systems and networks from the users point of view mainly through the development of adequate software; and,

(iii) set up establishments and maintenance of formal mechanisms for interaction among participants of the network.

The emerging scene in the information technology in developing countries could be data networks - new type of infrastructure - being ushered in by compelling forces of economic and technological change. They are the product of an exciting link-up between computers and telecommunication.

For any industrial development programme to be successful, it needs immediate and free access to the latest techno-economic information in the relevant fields of industry available in any part of the world. An effective means of obtaining such an access is through a well-organised modern information and documentation system using computers, microprocessors and telecommunication networks.

In this emerging scene, the information system can be visualised as a system of basically three components, viz., information, user, and staff, operating in a specific environment. Any information system, to be effective, should be designed, based on a study of the environment in which it operates with respect to its impact on users, information sources and professional manpower resources.

The system should be capable of constant readjustment based on the changes in environmental factors. The information system in the regions concerned should include the \*following elements as shown in the flow chart on page 44 :

\* A profile of the information sources which feeds the system.

A profile of different types of documents that enter the system.

The operations of systematic scanning of information, selective acquisition of documents and their technical processing.

Data bank of information relating to actual facts and data relating to industry as well as indexes relating to document/institutional/personal sources containing specific data and information.

Document bank or library of documents relating to the relevant subject fields.

Information retrieval systems based on electronic data processing system which gives immediate access to information contained in either data bank or document bank.

Analysis and synthesis of information to suit specific needs or specific users according to their special requirement.

Selective dissemination of information.

Project oriented dissemination of information to specific project teams in industries or institutions.

Other dissemination services like documentation lists, state-of-the-art reports, bibliographies etc.,

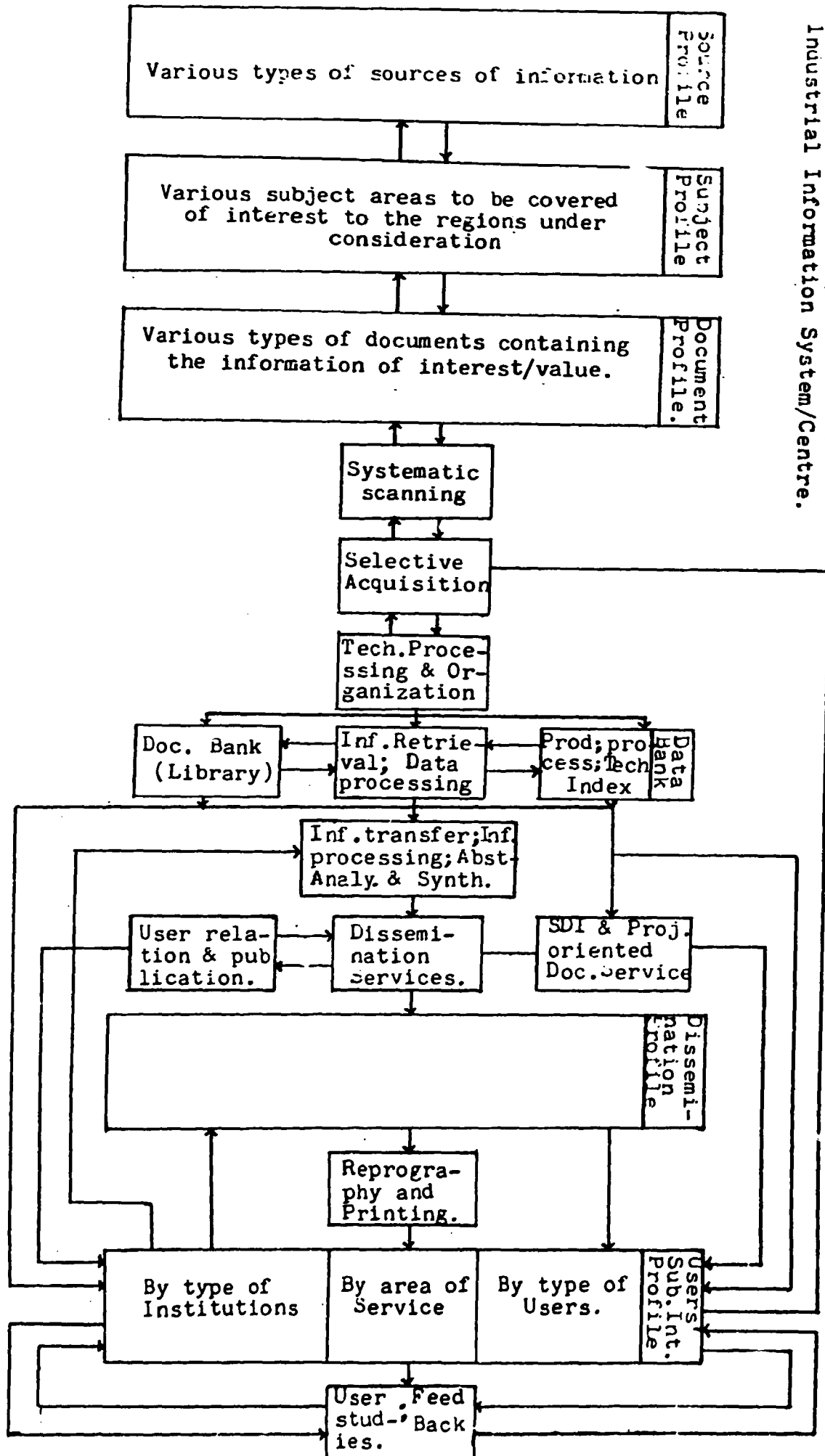
Publication activity for dissemination of information.

Reprographic & printing services to produce various dissemination services including publications.

User profile according to type of institution and type of occupation in different areas/regions coming under the purview of the proposed system as a basis for the services.

Feedback mechanism from users to redesign and reorient the system for maximum use.

Flow Chart of activities of proposed Industrial Information System/Centre.



An essential approach to science and technology information dissemination processes at the national level is to enrich the information resources and optimise their utilisation by all those who need them. Information processing should be co-ordinated to eliminate unnecessary duplication of effort and at the same time, to assure everyone of access to information.

Following are some salient suggestions which could be implemented by developing countries on priority basis :

Computer based information systems should not be an ad hoc development. They should be developed in a scientific way.

There should be a good compatibility between hardware and software development.

The specific areas of information to be computerised should be identified taking into view the techno-economic considerations.

Greater emphasis should be for information analysis service and various types of information packages.

There should be effective liaison between industry and university in developing information technology.

There should be Technical Information Centres at all medium and large industrial establishments and industrial estates.

An agency should be established on a national basis to train and develop personnel in the area of computer based information systems and information analysis.

Industrial Information Bank on modern lines to cater to the needs of the industries and entrepreneurs should be established.