ROLE OF DOCUMENTATION CENTRES IN COMMUNICATION AND DISSEMINATION OF SCIENTIFIC AND TECHNOLOGICAL IDEAS IN BANGLADESH

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BY

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I **Md. Mostafizur Rahman**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the North-Eastern Hill University for the degree of **Doctor of Philosophy** in Library and Information Science.

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LIST OF ABBREVIATIONS

ADONIS: Article Delivery Over Network Information Systems

AGP: Advanced Graphic Ports

AGRIS: Agricultural Information System

AIC: Agricultural Information Centre

AMDISA: Association of Management Development Institute in South-Asia

APINESS: Asia-Pacific Information Network for Social Sciences

BAEC: Bangladesh Atomic Energy Commission

BAIN: Bangladesh Agricultural Information Network

BALLOTS: Bibliographic Automation of Large Library Operations

BANSDOC: Bangladesh National Scientific and Technical Documentation Centre

BANSLINK: Bangladesh National Scientific and Library Information Network

BARC: Bangladesh Agricultural Research Council

BBS: Bangladesh Bureau of Statistics

BIDS: Bangladesh Institute of Development Studies

BIOSIS: Bio-Science Information System

BIRDEM: Bangladesh Institute of Research on Diseases of Endocrine and Metabolism

BLEND: Birmingham and Loughborough Electronic Network Development

bps: Bits Per Second

BTTB: Bangladesh Telephone and Telegraph Board

CABI: Commonwealth Agricultural Bureaux Index

CARIS: Current Agricultural Research Information System

CAS: Current Awareness Service

CCF: Common Communication Format

CD-ROM: Compact Disk-Read Only Memory

CDS/ISIS: Computerised Documentation System/Integrated Set of Information Systems

CIRDAP: Centre on Integrated Rural Development for Asia and the Pacific

CRT: Cathode Ray Tube

DAT: Digital Audio Tape

DESIDOC: Defence Scientific and Technical Information and Documentation Centre

DEVINSA: Development Information Network on South-Asia

df: Degree of freedom

DISC: Dissemination and Information Services Centre

DOS: Disk Operating System

DRDO: Defence Research Development Organisation

ECP: Extended Common Point

ed. eds.: Editor/Editors

EDI: Electronic Data Interchange

EJO: Electronic Journal Online

EPP: Extended Point-to-Point

ERNET: Education and Research Network

ESA: European Space Agency

FDD: Floppy Disk Drive

FID/DC: Federation International de Information and Documentation/Developing Countries

FRI: Fisheries Research Institute

FRILDOC: Fisheries Research Institute Library and Documentation Centre

FTP: File Transfer Protocol

GB: Gigabits

Gbps: Gigabits Per Second

GNP: Gross National Product

HDD: Hard Disk Drive

HeLLIS: Health Literature, Library and Information System

IBM: International Business Machine

ICAR: Indian Council of Agricultural Research

ICDDR,B: International Centre for Diarrhoeal Diseases and Research, Bangladesh

ICMR: Indian Council of Medical Research

IMED: Implementation, Management and Establishment Division

INIS: International Nuclear Information System

INRD: Information Network on Rural Development

INSDOC: Indian National Scientific Documentation Centre

INSPEC: Information Services for the Physics and Engineering Communities

ISA: Industry Standard Architecture

ISBN: International Standard Book Number

ISDN: Integrated Service Digital Network

ISN: Information Services Network

ISSN: International Standard Serial Number

ISTIC: Institute of Scientific and Technical Information in China

JANET: Joint Academic Network

JICST: Japan Information Centre for Science and Technology

JOIS: JICST Online Information System

Kbps: Kilobits Per Second

LAN: Local Area Network

LISA: Library and Information Science Abstract

MBPS/Mbps: Megabits Per Second

MEDLERS: Medical Literature Analysis and Retrieval Service

MEDLINE: MEDLERS Online

MHZ: Mega Hertzs

NAIS: National Agricultural Information System

NARS: National Agricultural Research System

NASA: National Aeronautics and Space Administration

NASTIP: National Science and Technology Information Policy

NATIS: National Information System

NCSA: National Centre for Supercomputing Applications

NCST: National Council for Science and Technology

NHLDC: National Health Library and Documentation Centre

NIC: National Informatics Centre

NIPORT: National Institute of Population Research and Training

NISSAT: National Information Systems for Science and Technology

NLM: National Library of Medicine

OCLC: Online Computer Library Centre

OCR: Optical Character Recognition Symbol

OPAC: Online Public Access Catalogue

PCI: Peripheral Component Interconnect

POPIN: Population Information Network

PSDN: Packet Switched Data Network

R&D: Research and Development

RAM: Read Access Memory

RECON: Retrospective Conversion

SAARC: South Asian Association for Regional Co-operation

SAIC: SAARC Agricultural Information Centre

SCSI: Small Computers System Interface

SDI: Selective Dissemination of Information

SDRAM: Synchronised Dynamic Read Access Memory

SIRNET: Scientific and Industrial Research Network

STI: Scientific and Technical Information

STN: Scientific and Technical Information Network

SVGA: Super Video Graphics Adapter

TCP/IP: Transmission Control Protocol/Internet Protocol

UNESCO: United Nations Educational, Scientific and Cultural Organisation

UNISIST: United Nations Information System in Science and Technology

USB: Universal Serial Board

VGA: Video Graphics Adaptor

VINITI: All Russian Institute of Scientific and Technological Information

VRAM: Video Read Access Memory

VSAT: Very Small Aperture Terminal

WAIS: Wide Area Information Server

WAN: Wide Area Network

WWW: World Wide Web

CHAPTER ONE

INTRODUCTION

Information is power. It is all pervasive in modern society. It flows today in various media and in various forms. Its production is of such an immense nature that we are really confronting with the phenomenon of information explosion. The basic problems arising out of information explosion are to identify, collect, classify, store, retrieve and disseminate specialised information, especially of scientific and technological nature, and make it available to the right person at the right time in the right form. To meet these challenges of information explosion, some institutions have sprung up in almost all the countries of the world. These are known as Documentation Centres or Information Centres. They act as intermediary communication centres concerned with communication of ideas/information among the scientists and technologists. As a scientific middle-man, these institutions are expected to be aware of advances in scientific and technological ideas and disseminate the latest information to scientists and technologists to help them in every conceivable way and to integrate and consolidate the collective knowledge for the benefit of all.

BANGLADESH

Bangladesh appeared on the world map as an independent and sovereign state in December 16, 1971, following the victory at the war of liberation from March 25

to December 16, 1971. It lies in the north-eastern part of South Asia between 20^0 34' and 26^0 38' north latitude, and 88^0 01' and 92^0 41' east longitude. The country is bounded by India on the west, the north, and the north-east and Myanmar on the south-east and the Bay of Bengal on the south. The area of the country is 56,977 sq. miles or 1,47,570 sq.km. with 111.4 million population and 34.2 percent literacy rate in 1991 (BBS:1997).

STATEMENT OF THE PROBLEM

As one of the least developed countries in the world, Bangladesh needs scientific and technological information to accelerate her economic as well as national development for the betterment of the people. Information is an essential prerequisite for research and development. On the other hand, an effective Documentation Centre makes link between researchers and their relevant information. Documentation Centres help to utilise national and international information sources and save the time of researchers. But there are a host of problems and difficulties existing in the communication and dissemination of scientific and technological ideas among the Documentation Centres and their users in Bangladesh. There is no effective and efficient linkage among the Documentation Centres, even though they do not have enough resources in terms of finance, personnel, collections, to function well alone. So, scientists and technologists suffer from the inadequacy of the relevant information. Further, in absence of linkages, co-operation and co-ordination among the Documentation Centres, they do not get access to national and international information sources. As a result, they tend to duplicate research or delay their tasks and the country sustains a loss of development. Therefore, it is essential to know the existing situation and the problems being confronted by the centres as well as their users. It is also necessary to build an effective network to speed up the communication and dissemination of

scientific and technological ideas. With the onset of INTERNET, networking has become very popular and essential communication tool between information and its users. Bangladesh has recently started joining this society by taking steps to create a Scientific and Technical Information Network. However, the progress is slow. A sense of helplessness and dissatisfaction is evident among the scientists and technologists. The study presented in this thesis is an attempt to probe into the problems being confronted by Documentation Centres as well as their users and suggest some remedial measures. Some earlier pieces of research have included suggestions on ways to improve the current condition of information communication and dissemination by creating information networks. However, they were more or less based on published information and have not been supported by any comprehensive investigation on the present situation of information handling and needs of scientists and technologists.

SIGNIFICANCE OF THE STUDY

This study would provide useful information concerning the prevailing conditions of Scientific and Technical Information Systems in Bangladesh. Further, it would help information scientists and policy-makers to know the information needs and information gathering habits of scientists and technologists. This study would also be of immense help in future information networks planning and development in Bangladesh.

DEFINITION OF TERMS

The definition of the terms used in this study are given below:

Documentation Centre/Information Centre

A place where information sources are identified, collected, organised,

analysed, synthesised, repackaged, stored, retrieved and disseminated.

Idea

An idea is the product of thinking, reflecting, imagining formed by the intellect by integrating, with the aid of logic, a selection from the apperception mass, and/or what is directly apprehended by intuition (Neelameghan:1975).

Information

This is taken to mean any idea, representation of reality, statement, or thought that determines practical action for the scientists and technologists (BANSDOC:1988) and it is interchangeable with idea.

Communication of Information

Communication of information is the transmission of information/ideas by a communicator to a communicatee.

Dissemination of Information

Distribution or transfer of information to individuals in an organisation by an information specialist (Kim:1990).

Scientific and Technological Idea

Information/ideas in the field of science and technology.

Scientists and Technologists

Those who are engaged in the scientific and technological research.

ORGANISATION OF THE STUDY

This study is organised in the following nine fine chapters with preliminaries, appendices and bibliography.

Chapter 1: Introduction containing Bangladesh, statement of the problem, significance of the study, definition of terms, organisation of the study;

Chapter 2: Review of related literature;

Chapter 3: Methodology containing objectives, hypotheses, methodology;

Chapter 4: Role of Documentation Centres in economic development;

Chapter 5: Current status of Documentation Centres in Bangladesh;

Chapter 6: Use of Documentation Centres

Chapter 7: Information needs and channels;

Chapter 8: Information communication and dissemination;

Chapter 9: Networking in Bangladesh;

Chapter 10: Findings and suggestions.

The next chapter presents the review of related literature.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Review of literature is confined to the period from 1980 to the present. The choice of the year 1980 has been done primarily for two reasons. Firstly, there is such a explosion of literature in this field as to include it all within the length of this thesis. Secondly, Documentation Centres entered a new phase in 1980s which is still continuing. The sources consulted are *Library and Information Science Abstracts* (LISA), *ProQuest Dissertation Abstracts*, books, dissertations, reports, proceedings, journals, and Government publications. As all used sources were not available in one place, so visits were made to various Libraries and Documentation/Information Centres of Bangladesh and India. The search terms which proved to be very useful were: Documentation, Documentation Centres - Science and Technology, Documentation services - Science and Technology, Information Centres - Science and Technology, Information services - Science and Technology, Information systems - Science and Technology, Networking - Science and Technology.

A. BANGLADESH

A.1. STRUCTURE

According to BANSDOC survey report (1993), it is observed that most of the

scientific and technological Documentation Centres in the country are attached to their parent organisation. A very few Documentation Centres exist to work independently, namely, BANSDOC and NHLDC. BANSDOC (1993) report also reveals that 61 R&D organisations and 106 departments of 8 (out of then 11) government universities in the country are under 13 ministries. These organisations and departments are each maintaining a Library or Documentation Centre. The number of different ministry-wise organisations are shown in the Table 2.1.

TABLE: 2.1

MINISTRY-WISE ORGANISATIONS

Sl. No.	Name of the Ministry	No. of Organisations
1.	Ministry of Agriculture	16
2.	Ministry of Commerce	01
3.	Ministry of Communication	01
4.	Ministry of Defence	01
5.	Ministry of Education	08
6.	Ministry of Energy and Mineral Resources	02
7.	Ministry of Environment and Forests	03
8.	Ministry of Fisheries and Livestock	16
9.	Ministry of Health and Family Welfare	10
10.	Ministry of Irrigation, Water Development and Flood Control	02
11.	Ministry of Science and Technology	07
12.	Ministry of Textile	01
13.	Ministry of Works	01
	Total=	69

Source : *BANSDOC, 1993:2.*

A.2. SERVICES

BANSDOC (1995) reports that the following types of documentation and information services have been provided by different Documentation Centres of the country:

a. Identifying the varied needs of the scientists, technologists, doctors,

engineers, agriculturists, planners, policy-makers, and administrators in the respective areas of their specialisation;

b. Acquiring, processing, managing, and preserving literature;

c. Providing traditional bibliographic services, literature searches through in-house and CD-ROM databases, and document delivery service;

d. Compiling various types of bibliographies, directories, and inventories in the respective areas of specialisation;

e. Conducting short training courses for information science professionals;

f. Providing assistance to scientists and technologists in establishing contacts with scientists and technologists working in similar fields in and outside the country;

g. Providing current awareness services through current awareness bulletins, SDI service, notices, and telephones;

h. Providing loan and photocopying services;

i. Providing readers' and reference services;

j. Establishing contacts and maintaining liaison with similar bodies abroad and acting as the focal point for regional and international co-operation information systems, like AGRIS, CARIS, HeLLIS, INIS, SAARC etc. in the respective areas of specialisation.

A.2.1 PROBLEMS

Hossain (1982) reveals that almost all the Documentation Centres face problems such as lack of space and finance, inadequate numbers of professionally-trained staff and limited collections. Islam and Dewan (1993) and BANSDOC (1995) also support the above findings and remark that the documentation and information services in the country have not yet been able to reach the level of development to effectively support research, and industrial and socioeconomic

development efforts in Bangladesh. The Documentation Centres have been suffering from the following shortcomings:

a. Absence of a National Library and Information Policy, and National Science and Technology Information Policy (draft submitted to the government);

b. Low priority given to documentation and information in planning and management of the educational, research and development programmes;

c. Low professional status accorded to information science professionals;

g. Inadequate administrative and financial procedures for the acquisition of books and subscription of journals;

h. Tendency of institutions or units to build up their own collection of learning resources and documents, and avoid sharing them with others;

J. Lack of an up-to-date national union list of periodicals which could help users locate a journal in the country and avoid duplication in journal subscriptions;

k. Lack of knowledge of the existing information resources either at the national, regional or international level;

m. Lack of communication between institutions which hinders the flow of information;

n. Lack of proper bibliographic control of national literature;

o. Lack of modern electronic and telecommunications facilities;

p. Lack of microform facilities either for production or use;

q. Poor organisation of documentation and information services which lead to loss of publications and difficulties in retrieval;

r. Absence of a national body or committee to advise government on documentation and information affairs;

s. Absence of appropriate standards;

t. Absence of advanced training facilities for information science professionals

abroad;

u. Lack of a cadre service;

v. Poor working conditions and insufficient infrastructural facilities;

w. Lack of capable leadership in the profession.

A.2.2. SOLUTIONS TO THE PROBLEMS

Siddique (1988) says that the foremost pre-requisites to the development of nationwide information services are- (i) the formation of National Science and Technology Information Policy and (ii) the formation of National Science and Technology Information Committee for the proper implementation of the policy.

Islam and Dewan (1993), suggest 12 points solution to the problems of scientific and technical information services. The main suggestions are-

a. A national library and information policy is necessary to coordinate the activities of Documentation Centres in various sectors;

b. One national coordinating body having appropriate mandate from higher authorities is necessary;

c. The traditional static library approach should be replaced by the dynamic approach;

d. All Documentation Centres should get an equal importance like others agencies or institutional activities;

e. All Documentation Centres should take part in resource-sharing activities;

f. All institutions should participate effectively in local, national, regional and international information systems and services;

g. All Documentation Centres should be equipped with the modern basic electronic and reprographic equipment;

h. Facilities for advanced training of information science professional should be provided.

A.3. NETWORKING

Islam (1983), has proposed a *Network in Science and Technology for Bangladesh* in his Ph.D work on *Documentation and Information Activities in Bangladesh*. This study has conceptualised the network in three distinct interacting levels i.e. (1) Local levels, (2) National levels, (3) International levels. The proposed network pre-supposes the categorisation of Libraries, Documentation and Information Centres around certain common fields of specialisation like agriculture, medicine, engineering and pure science etc. Proposed interacting three levels are shown in figure 2.1.

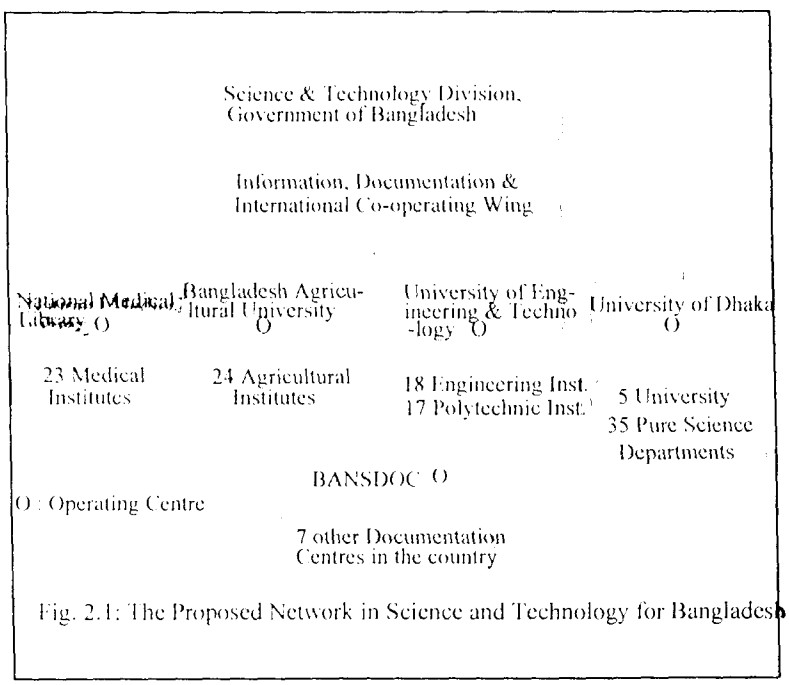

Fig. 2.1: The Proposed Network in Science and Technology for Bangladesh

This study proposes 5 (five) operating centres, namely- (1) National Medical Library, Dhaka, (2) Bangladesh Agricultural Research Council (BARC), Dhaka, (3) University of Engineering and Technology, Dhaka, (4) University of Dhaka, (5) BANSDOC, Dhaka. These operating centres are supposed to utilise the resources held in participating centres and also make available those materials which are not available in any participating centre. It has been also suggested that operating centres would be co-ordinated by the *Information, Documentation and International Co-operating Wing*, Science and Technology Division (Now it is Ministry of Science and Technology), which would maintain close links with other national and international information systems like,

NISSAT, UNISIST, NATIS, VINITI, INIS etc. The study has also suggested the information systems or networks for Bangladesh to be on the pattern of the NISSAT programme of India.

This study while defining pure sciences, has included under as scope of Physics, Chemistry, Mathematics, Botany, Zoology and Earth Science, whereas Botany and Zoology departments of various university have been shown under the Agriculture and Animal Husbandry category. There are a number of such glaring contradictions in the proposed network relating to categorisation of the centres, for example:

1. Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka, has been included under the Agriculture and Animal Husbandry category;
2. Bangladesh Atomic Energy Commission, Dhaka, has been shown in the Engineering and Technology category, whereas Documentation Centre of Bangladesh Atomic Energy Commission, Dhaka, has been included under the Documentation Centres category.

According to Bangladesh Gazette (1986), Khan (1988), Ahmed (1988) and BANSDOC (1988), it is known that the *National Science and Technology Policy:1986* has proposed three-tier Science and Technology Information System to operate under the general supervision of the National Council for Science and Technology (NCST) as:

First Tier : The Bangladesh National Scientific and Technical Documentation Centre (BANSDOC).

Second Tier : Four sub-groups, situated in convenient institutions and having independent facilities for storage, documentation, copying, microfilm/microfiche, etc. in their respective areas, would deal with- (i) Physical sciences, (ii) Agriculture, livestock, fisheries and rural development sciences, (iii) Medical and Biological sciences, and (iv) Engineering and Technology.

Third Tier : All scientific institutions (research and educational) would continue to have their Information Centre facilities and subject-wise specialisation.

Khan (1988) remarks that this policy "recognises that, in Bangladesh, scientific and technological information, is handled by several organisations and institutions, and hardly coordinated".

According to BANSDOC (1988), it is ascertained that the *National Science and Technology Information Policy* has proposed four-tier hierarchical information network in the field of science and technology in Bangladesh as follows:

First Tier : BANSDOC as a coordinating body and national focal point;

Second Tier: National libraries and information centres in different branches of science and technology;

Third Tier : Resource libraries and information centres;

Fourth Tier : Dependent libraries and information centres.

The policy proposes that the national and resources centres, in their respective fields of interest, would receive free copies of all publications produced in the country, and the network would institute a document-delivery system through all participating institutions. Khan (1988) mentions that the policy urges to pursue and organise resources-sharing process through inter-library loan and cooperation to facilitate document-delivery system among the participating centres. The policy proposed to connect all related major Information Centres through telecommunications network with the BANSDOC. It has also been proposed to develop a national computerised database of conventional and non-conventional Bangladeshi literature produced in the country and elsewhere. Khan (1988) identifies three major constraints to implement this policy- (i) non-availability of necessary facilities and sources, (ii) lack of appropriate infrastructure and organisational set up, and (iii) shortage of skilled, trained manpower, particularly in new information technologies and information-handling tools. He is of the view

that the success would be depended on the attitudes of the information science professionals. The BANSDOC Annual Report (1995) reveals that this draft policy has proposed, the Dhaka University Library (DUL); Agricultural Information Centre (AIC) of Bangladesh Agricultural Research Council (BARC), Dhaka; National Health Library and Documentation Centre (NHLDC) of the Ministry of Health and Family Welfare; and the Bangladesh University of Engineering and Technology Library (BUETL) to be designated as the Sectoral Information Centres, respectively, on Physical Sciences, Agricultural Sciences, Medical and Biological Sciences, and Engineering and Technology. Rahman (1996) reports that the policy has proposed liaison with other Networks and Information Systems in the region, particularly the SAARC and other countries, as well as at the international level through the national coordinating body, the BANSDOC. He also informs that the draft policy has been submitted to the government in 1989 for approval and implementation, but still under consideration.

Ahsanullah (1988) says that it is not possible to collect all types of information sources and to supply them to the users engaged in R&D activities. So, we shall have to develop close cooperation with the existing information centres in and outside of the country. By taking such steps, we may be able to fulfill the existing communication gaps among the sources and users in the field of science and technology to a considerable extend. He also proposes that BANSDOC should act as the Central Documentation Centre of the country and co-ordinate the activities of local Information Centres spread over the country which are supposed to act as support centres to the regional resource agencies or to the central agencies

and vice-versa in a manner that is both cheaper and easier to operate. One of the obvious benefits of such information network will be faster communication among the nodes in the network as shown in the figure.:2.2

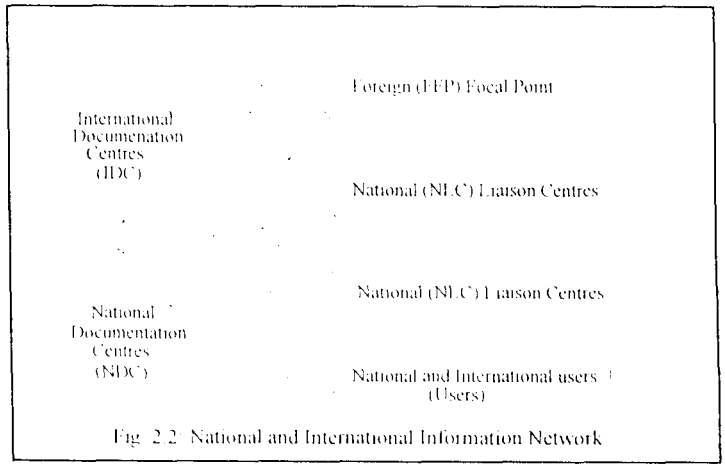

Fig. 2.2: National and International Information Network

According to AIC (1992), it is known that an attempt was made in early 1982 to formalise a Bangladesh Agricultural Information Network (BAIN) but could not materialise due to the lack of financial support. AIC (1992) and BIDS (1993) mention that Agriculture Information Centre (AIC), Dhaka has taken an initiative to launch a network of agricultural institutions to make available information and literature to the agricultural scientists. The network is known as NAIS (National Agricultural Information System). Of the 36 agricultural organisations and institutions, 12 have been participating in this programme. BIDS (1993) also states that an initiative has been taken in 1992 by the National Institute of Population Research and Training (NIPORT), Dhaka, to establish an information networking system in the domain of health, population, family planning and maternal and child health in collaboration and cooperation with the government and non-government organisations.

BIDS (1993) and BANSDOC (1995) report that the concept of information-networking is a new development in the country to assist in ensuring the maximisation of access to and optimum use of the information resources. The country has not yet been able to formalise this component of information acquisition-processing-dissemination cycle. It is apparently rooted more in a theoretical framework rather than on the practical considerations. They also report

that some other networks in the country are- Social Science Information Network in Bangladesh; Bangladesh Development Support Information and Communication (BDSIC) Network; Information Network on Rural Development (INRD); AMDISA Library Network, and Women Information Network (WIN).

Hoque (1993) reports that the national network in the field of health science in Bangladesh was initially established in 1975. He also reports that since the inception of HeLLIS (Health Literature, Library, and Information Services) network in 1979 in South East Asian Region of World Health Organisation, it has included Bangladesh as a participating country and the Government of Bangladesh identified the NHLDC as the National Focal Point (NFP) of HeLLIS in 1981 for carrying on all network activities at the national level. The National Network of HeLLIS in Bangladesh consists of three tiers: (i) Top-tier, (ii) Mid-tier, and (iii) Basic-tier. Where NHLDC is the Top tier, all resource libraries (RC) are the Mid-tier and all dependent/minor libraries (DC) are the Basic-tier.

Sattar (1997) conducted a survey on 132 different types of Libraries and Documentation Centres in the country and suggests that authorities may consider the following solutions to create better environment for the use of new technologies.

- a programme should be chalked out for training library personnel in handling and exploiting new technologies;
- a standardised Bengali thesaurus should be developed for the use of computer systems employed in information centres of Bangladesh;
- the departments and institutes of Library and Information Science should introduce papers on data analysis, programming and computerised information retrieval and dissemination; and
- an integrated software package should be developed. It should be available both in English and Bengali characters.

This study also made some recommendations, the main of them are-

- to consider the need to establish a new organisation like *Bangladesh Integrated Library and Information Centre Automation Service (BALICAS)*. The BALICAS will act as a focal point to coordinate the system throughout the country and support the Information Centres in all respects. It should play the role of an information services centre rather than of a resource centre and act as a national coordination body under the Ministry of Education;
- to develop appropriate infrastructural facilities to make resource sharing and information network efforts a success;
- to begin to create databases of the country's publications and documents; and
- to set appropriate standards relating to technical aspects of the use of new technologies, resources sharing and networking systems.

Mannan (1997) surveyed 25 (Twenty five) different types of Libraries and Documentation Centres of the country and interviewed 100 (hundred) users from various groups by questionnaire method and proposed a network named *Bangladesh Academic and Special Library Network* (BASLIBNET) with the primary objectives to provide access to all types of information resources to all persons in all locations within the country. Proposed major functions and activities of this network are: (i) General functions, i.e. Cooperative acquisition of books,

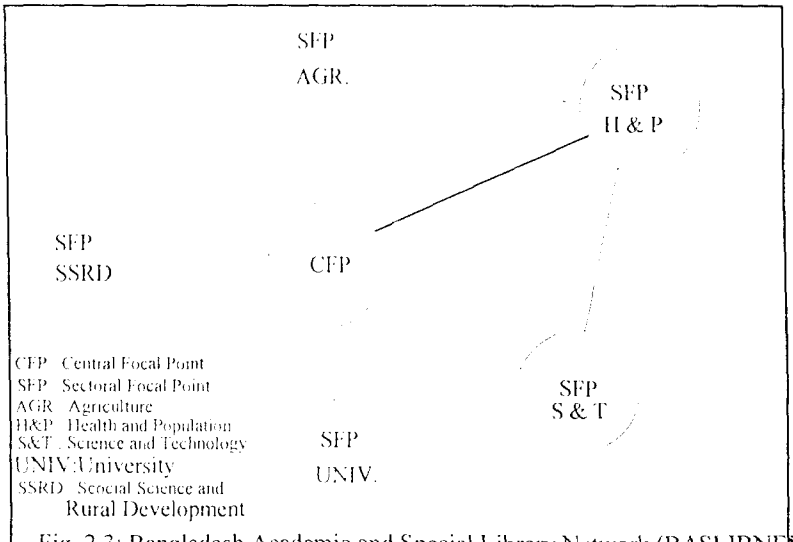

Fig. 2.3: Bangladesh Academic and Special Library Network (BASLIBNET)

periodical, literature, translations and photocopies etc.; Coordinated subscription; Exchange of duplicate holdings; Identification of core subjects; (ii) Technical functions, i.e. Cooperative processing; Preparation of user catalogue; Inter-library loan, reference and/or referral services; Abstracting and indexing services, bibliographical services etc.; (iii) Publication Programme, Information Repacking functions; (iv) Coordination services; (v) Research, Training and other special functions; and (vi) Other functions, i.e. User orientation, liaison with other national, regional and international networks for cooperation and exchange of information etc. This study has proposed 5 (Five) Sectoral Networks. These are- (a) Sectoral Network for Agricultural Libraries, with AIC of BARC, Dhaka as the focal point, (b) Sectoral Network of Health and Population Libraries, where NHLDC is the proposed focal point, (c) Sectoral Network for Social Sciences and Rural Development Libraries, with BIDS as the focal point, (d) Sectoral Network for Science and Technology Libraries, with BANSDOC as the focal point, (e) Sectoral Network of University Libraries, with Dhaka University Library as the focal point. After creation of the Sectoral Networks, the configuration of the Integration of the Sectoral Networks will be as shown in Fig.:2.3. This Integrated Network will be named as BASLIBNET and one co-ordinating body will have to be formed for this which will act as the Central Focal Point (CFP).

BANSDOC (1998) reports that it has been establishing a computerised telenetwork named, *Bangladesh National Scientific and Library Information Network* (BANSLINK). In this network, 15 (fifteen) scientific and technological participating Libraries and Documentation Centres' computers have been connected with the Network Service Centre (NSC), i.e. BANSDOC and the NSC is connected with INTERNET. This network has developed its own application software on FoxPro platform. The NSC will be providing centralised services such as- (i) On-line search of international databases, (ii) CAS, (iii) SDI Services (iv) Inter-library

lending services, and (v) Document supply services very soon.

B. RELATED STUDIES

The importance of, and need for, scientific and technical information and its implication for the national development have been emphasised by many authors (Nitecki:1995; Curras:1994; Ali:1989; Nkereuwem:1985; Manda:1984; Inganji:1982; Arunachlam:1982). Inganji (1982) remarks that scientific documentation and information and the creation of efficient documentation and information services in developing countries can prove a distinct help and offer considerable relief to scientists and researchers. Mutou (1993) expects that a highly informed society very soon will be based on the three components: (a) data processing machinery with electronic communication as its core, (b) Communication media, and (c) Telecommunication channels.

B.1 DEVELOPING COUNTRIES

Hoover (1980) states that developing countries heavily dependent on scientific and technical information (STI) from the industrial nations. They often lack adequate research libraries and information centres and therefore often have difficulty in locating the necessary STI. He asserts that on-line bibliographic retrieval services can play a key role in meeting their STI requirement, but problems to be overcome include a lack of understanding of on-line, lack of trained personnel, inadequate telecommunications, and document delivery shortcoming.

Saracevic (1980) remarks that many countries have created information systems dealing with a given scientific or technical field. The major difference between less developed countries and developed countries is that the less developed countries have fewer national STI systems and developed countries have more subject STI systems.

Neelameghan (1980) mentions that the planning of national information system or network involves the design and development of several infrastructural elements such as- (a) information resource centres, (b) capability for receiving, recording, publication, dissemination and bibliographical control of information generated within the country, (c) linkages to human information sources, (d) availability and supply of trained information professional personnel of various categories, (e) linkages to appropriate decision-making bodies, (f) means, methods and technologies for convenient access to and delivery of information in a form tailored to the needs and capabilities of the specific users, (g) means of sensitising and training people from childhood onwards in the use of information, information resources and information systems, and (h) national information and communication policies.

Freund (1982) suggests that scientific and technical information system for developing or less developed countries will be more likely to succeed if they are placed in institutions with specialised activities. He identifies the following essential factors for success, such as:(i) a selective dissemination of information (SDI) service; (ii) an interface office to deal with user enquiries; (iii) a reasonable primary document collection and access to other collections; and (iv) availability of secondary information sources.

Pachevsky's (1983) survey reveals that some experts believe that international co-operation and co-ordination of information services can solve the problems of scientific and technical information (STI) in developing countries; others emphasise the importance of information technology and its application to information processes.

Eres and Noerr (1985) have identified the problems relating to literature (information) access in the less developed countries such as- "(i) inability to access/use secondary services; and (ii) inability to obtain relevant primary literature

in a timely and cost-efficient fashion". They again remark that countries of smaller scientific size as measured by number of scientists and supported by number of information centres have more difficulty in supplying current journal literature. So, they propose two types of networks as solutions to the problem. The first type of network is suitable for places where a reasonable computing and telecommunications infrastructure already exist to handle at least some form of online services. The second type network involves "areas where there are less computing facilities, a less sophisticated telecommunications structure, and less development in the area of information policy".

Neelameghan and Tocatlian (1985) identify the following requirements at the national level that will lead to an ideal Global Network : (i) strengthened information systems and services; (ii) training in information handling procedures; (iii) use of standards for information handling such as uniform rules for recording and structuring information and references to information, including subject control tools; and (iv) adequate computer and telecommunications facilities.

FID/DC (1985) suggests that the main elements of the system of documentation and information services should be:- (i) the government agency for management, planning and co-ordination; (ii) the national documentation centre; and (iii) a network of specialised documentation centres to be gradually built up according to the needs of economic, scientific and technical development. The group also suggests that it may be two kinds: (a) state-run centres, (b) specialised centres of private companies, industrial centres, research centres, etc.; (iv) the national library; (v) a network of specialised libraries to cover information needs in specific fields of science and technology; and (vi) specialised documentation centres concerned with patent literature, standards, etc.

Saracevic (1986) identifies the basic processes involved in information consolidation such as- (i) study of potential users; (ii) selection of information

sources; (iii) evaluation of information; (iv) analysis; (v) reconstructing; (vi) packaging and/or repackaging of restructured information; (vii) diffusion or dissemination of information; and (viii) feed back.

Villars (1994) urges that information centres in developing countries should develop a more global perception of information sources and adopt the strategy of networking and resource-sharing in solving their problems.

B.1.1 CHINA

Xingyun (1983) reports that ISTIC (Institute of Scientific and Technical Information in China) system consists of four elements such as- (i) The national information centre, i.e. ISTIC and its Chongqing Branch; (ii) 29 provincial, autonomous regional and direct municipal information institutes with 7 regional centres; (iii) 43 ministerial information institutes; and (iv) National and regional information exchange networks of specialities. The system is shown in Fig:2.4.

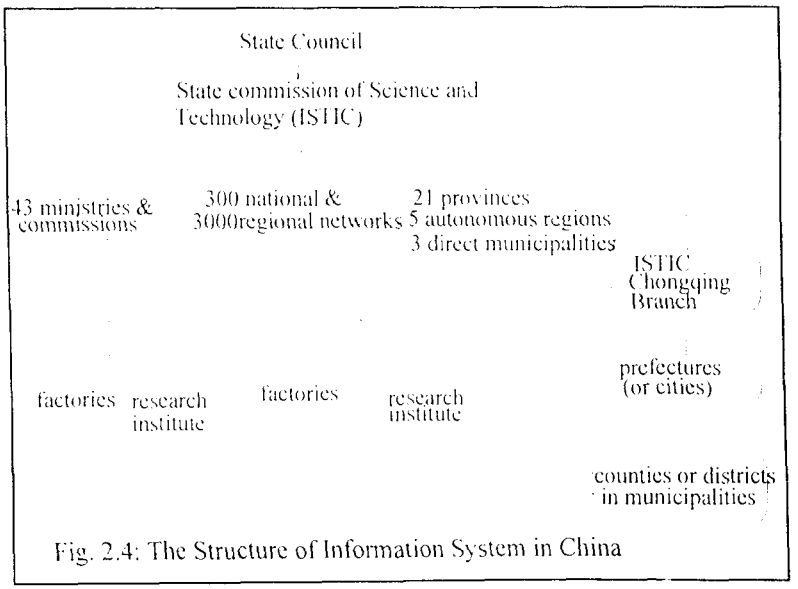

Fig. 2.4: The Structure of Information System in China

He also reports that during the past decade, ISTIC has completed an unified thesaurus which will cover various disciplines in the social and natural sciences. This is a very important step towards the maximisation of machine retrieval. He also mentions that "In co-operation with Language Institute of the Chinese Academy of Social Sciences and the Statistics Institute of Chinese Academy of Sciences, ISTIC has established an English-Chinese titles machine

translation system using a China-made Type II computer". Fayen (1986) states that ISTIC has completed computer processing of *Hanzi* textual materials in a machine-readable database.

Zhishan (1987) highlights that the Institute of Scientific and Technical Information of Shanghi (ISTIS) has begun to provide computerised information retrieval and international on-line retrieval for the users, and is preparing to build up the computerised information retrieval network within the Shanghai region.

Sessions (1990) reports that the leading scientific and technical institutions of Shanghai offer data base searches in their information centres. They use DIALOG system in on-line searches. They also search on CD-ROM and also are mounting external databases on their own hardware and software systems.

B.1.2 EGYPT

Bassit, Nour and Elshishiny (1994) state that the Egyptian National Scientific and Technical Information Network (ENSTINET) of the Egyptian Academy of Scientific Research and Technology (EASRT) offers access to local databases, CD-ROM and international on-line databases; document delivery services of local and international resources; ENSTINET's remote user system; and ENSTINET's publications and training courses.

B.1.3 INDIA

Chakrabartibiswas (1982) states that the activities of the Indian National Scientific Documentation Centre (INSDOC) in disseminating scientific and technical information, the National Informatics Centre's (NIC) endeavours in developing computerised information systems and the programme of National Information Systems for Science and Technology (NISSAT) have already made considerable impact in scientific and technical information fields. The NISSAT has

made prompt and efficient transfer of technological information to 70,000 add villages. Lahiri (1995) reports that the NISSAT programme envisages promotion and support to the development of a compatible set of information systems on science and technology and inter-linking them into a network. He also informs that the NISSAT has taken an initiative for the development of metropolitan library networks. The main of them are- Calcutta Library Network (CALIBNET), Delhi Library Network (DELNET), Bombay Library Network (BONET), Madras Library Network (MALIBNET), Ahmedabad Information Network (ADINET), Hyderabad Library Network (HYLIBNET), Pune Network (PUNENET) etc. The NISSAT also has established e-mail facilities through ERNET to the various NISSAT information centres dispersed in the country. Mangla (1996) clarifies that the NISSAT network comprises of the followings tiers: (1) Sectoral Information Centres (SIC), (2) Regional Information Centres (RIC), (3) Other specialised services centres; with the NISSAT headquarters functioning as the national focal point. Rao (1997) informs that the MALIBNET has been established and is being operated by INSDOC Regional Centre, Madras. This network is offering a host of services for the benefit of its members.

Mangla (1996) reveals that the information centres in India, are providing "SDI, CAS, repackaging of information and referral services". Computerised information services are already been provided by several information centres, namely, INSDOC, DESIDOC, Bhabha Atomic Research Centre etc. He also identifies the weak point of information centres, such as- (i) scattered resources, (ii) inadequate communication linkages, and (iii) lack of proper co-operation and co-ordination. He urges the need for- (i) developing programmes of sharing of resources and services so as to minimise duplication and maximise the utilisation of financial resources and other facilities, and (ii) providing access to resources so that any user living any where may have the required information at a time when

he needs it and in a form that world best suit his purpose. He also reports that the following telecommunication and information technologies have been developed during the past few years. These are- (i) use of satellite communication technology, and (ii) increasing availability of microcomputers, and growth of indigenous computer industry.

According to INSDOC Annual Report:1994-95(1995), it is known that INSDOC is providing services such as- (1) *Personalised Information Services* (PIS), namely, (i) Contents, Abstract and Photocopies (CAPS), (ii) Chemical Abstracts Keyword Index Service (CAKIS) (iii) Standing Order Abstract Service (SOAS), (iv) Full Text Journal Service (FTJS), (v) Bibliometric Analysis etc.; (2) *Corporate Information Services* (CIS), namely, Patent Watch Services (PWS), Competitor Watch Services (CWS), and Global Tender Watch Services (GLOBTEND), etc.;(3) *General Information Services (GIS):* Some of these services are (i) Literature Search, (ii) Foreign Language Translation of Scientific and Technical Documents, (iii) Document Copy Supply, (iv) Desk Top Publishing (DTP), and (v) Printing and Reprographic services.

INSDOC (1995) reports that the SIRNET (Scientific and Industrial Research Network) is a computerised network linking scientific and technical institutions throughout the country. The network mainly allows e-mail service and facilitates ordering of document copy supply and receiving literature search or contents information of selected journals output on e-mail and also proved access to indigenous online databases. Rao (1997) reports that "SIRNET is now having 115 nodes out of which 40 are mail nodes and 75 user nodes". Rao (1997) and INSDOC (1995) report that INSDOC has developed a few in-house databases, which are available in online to the users. These databases include- (i) Current contents of Indian Journals, (ii) National Union Catalogue of Scientific Serials in India (iii) Polymer Science Databases, (iv) Database on Indian Patents, (v) Medical and

Aromatic Plants Abstracts Database, and (vi) Material Science Bibliographic Database. Rao (1997) also indicates that INSDOC has developed a complete library automation software package called 'Granthalaya'. It is an integrated, menu-driven, user-friendly software and can be operated in DOS, UNIX and WINDOWS environments. It is based on object-oriented design and analysis and is completely modularised.

INICAE (1996) notes that Department of Electronics (DoE), India has the capacity to link the entire academic and research community in India through ERNET (Education and Research Network). Over 300 institutions including universities, R&D organisations, research laboratories are already using it. This network is offering access to 120 countries information resources through Global INTERNET and is providing the following services: (i) Electronic mail, (ii) Remote log-in, (iii) Database access, (iv) File transfer, (v) Mailing list, news groups and bulletin boards, and (vi) Information retrieval tools, namely, Gopher, WAIS, WWW.

Khanna (1996) reports that the following notable developments have been made over the years in the Defence Scientific and Technical Information and Documentation Centre (DESIDOC): (i) organisation of international conference on bibliographic databases and networks to obtain technical inputs on the design, development and implementation of a bibliographic database and network in the country; (ii) development of on-line library catalogue, accessible through remote areas; (iii) continuation of manpower development programmes in collaboration with other agencies; (iv) provision of the facility of gateway packet switched data service made available by Videsh Sanchar Nigam Ltd., to Delhi users for searching information at cheaper rates; (v) production of a video film on DESIDOC titled "New Information Technology and Services in a Modern Information Centre DESIDOC"; and (vi) popularisation of Defence science among the masses.

DESIDOC News (1998) reports that DESIDOC has been developing an OPAC of DRDO library holdings. Presently, the OPAC provides access to more than 1.75 lakh books/reports available in 30 DRDO libraries. The OPAC is available online and can be searched through I-NET as well as in dial-up mode.

B.1.4 IRAQ

Jacso and Razzaq (1986) report that with the realisation of the value of scientific and technical information, the Scientific Research Council (SRC) in Iraq established a Scientific Documentation Centre (SDC) in 1972 to meet the information needs of researchers. They also state that a computerised information service, based on the UNESCO's CDS/ISIS software package, was designed to establish "a locally-developed and operated scientific and technical information network".

B.1.5 KOREA, REPUBLIC OF

Kim (1990) surveyed 34 information centres (10 government-supported and 24 industry-supported) belonging to research and development institutes in the areas of science and technology in the Republic of Korea. The survey reveals that all of the information centres in this study participated in resource-sharing in a very limited way. Despite the lack of resource-sharing, several of them are involved in interlibrary loan services, photocopy services, and construction of union catalogues/lists. Twenty information centres currently participate in one or more types of information networks on the national or international level. The most serious difficulties or barriers in operating ongoing or new cooperative/system activities were " a lack of standardisation", followed by "a lack of information technology". The most highly necessary functions or requirements for a model information network for Korea expressed by respondents were "developing a

national policy for science and technology information", "constructing national material databases", and "developing and updating information retrieval languages". The findings also indicate that information centres in Korea have sufficient capabilities to improve the present status of information networks in terms of funding, personnel, information technology, information infrastructure, and support from the parent institutions. The major recommendation for the model information network was the development of science and technology information policy that supports and is consistent with the science and technology policy. A second recommendation was the standardisation among information systems, in order to facilitate inter-system communication. A third recommendation was greater co-operation, such as co-ordinated acquisition and cataloguing activities.

Yip (1991) reports that the state system for scientific and technical information is now classified into 3 levels. These are- (i) the central scientific and technical information institute; (ii) central organs in the field of national economy; and (iii) base level units.

B.1.6 MEXICO

Molino (1986) reports that the access of on-line bibliographic databases in Maxico is provided through SECOBI (Consultation Service to Information Banks), a service operated since 1976 by CONACYT (National Council for Science and Technology). The main purpose for the initiation of this service was to develop a national information system for science and technology.

Beaumont (1994) reveals that the Mexican National Centre for Information and Documentation on Health (CNIDS), makes up-to-date materials available on topics of priority interest to teachers, researchers and health practitioners by using international databases on CD-ROM and the resources of related national networks, namely, RENCIS (National Network of Collaboration on Information and

Documentation on Health), SINARIS (National System for Registering Research on Health) and ECINI (Catalogue of National and International Events).

Ambriz, et.al. (1996) state that Mexican Academic Network (MEXNET) developed to communicate and share information documents; has now developed new services in response to user demand for training in computers and languages; and on-line access to national and international networks.

B.2 DEVELOPED COUNTRIES

B.2.1 BULGARIA

Simeonov (1980) reports that the National Systems for Scientific and Technical Information in Bulgaria is providing centralised computer processing of SDI. He says, completely centralised SDI is impossible, so there is a network of smaller centres and units which check listings before sending them to users.

Kiratsov (1983) states that the Central Institute for Scientific and Technical Information, the main organ of the National System for Scientific and Technical Information (NSSTI) of Bulgaria is offering centralised automated STI services for users in the country since 1970s. The centre is facing a number of problems, including those connected with the improvement of hardware and of access to world information resources.

B.2.2 CZECH REPUBLIC

Babka and Kotherova (1990) report that the Centre for Automatic Information Exchange (SAVI), provides its users with access to database centres of the COMECON countries via personal computers and a SAVI control computer. In addition to providing a telecommunications network, SAVI also provides the necessary software and support to its users. Its network comprises 2 database centres in Russia and 1 in Bulgaria, 2 e-mail systems i.e. MAILBOX and ADONIS,

and 1 system providing information on the availability of host computers and databases.

Babka (1996) overviews the electronic information industry and reports that 1994-95 has seen rapid development in domestic information resources, with technical and software standards up to Western levels. There are a number of public networks in the Czech Republic. In addition to these networks, a number of private networks are being created, offering services such as e-mail and INTERNET access.

B.2.3 FRANCE

Moureau (1984) reveals that the major institutions in France are giving primary attention to developments in bibliographic databases. He says that specialised French documentation centres and libraries need: "creating documentary holdings covering within the limit of the financial means available, subjects of interest to their users; creating documentary files and catalogues so that access can be gained to these holdings".

Pelissier and Gross (1985) look at the different uses of microcomputers in the Scientific and Technical Documentation Centre of the National Scientific Research Centre (CDST), France, the producer of the PASCAL database. He reviews the operational applications and projects in the following domains: creating small local data banks, decentralised input to a large database, down loading, reformatting and retrieval, SDI on floppy disks, training of users, connection to telex and other office automation applications.

Patou (1994) reports that the French Institute of Scientific and Technical Information (INIST) has produced a number of databases. The main databases are PASCAL and FRANCIS. PASCAL contains over 10 million references in the areas of medicine, technology and natural sciences, which is available via several on-line

systems including QUESTEL, DIALOG and ESA. FRANCIS, contains over 1.5 million of references to humanities and social sciences, available via QUESTEL. Both databases are also available on CD-ROM.

B.2.4 JAPAN

Suwa (1980) reports that the Japan Information Centre for Science and Technology (JICST) has developed its own on-line computer system, named JICST On-line Information System (JOIS). He also mentions that the JOIS-II (JOIS, 2nd version) includes over 30 users commands, many search and storing capabilities, automatic SDI and copy ordering facilities.

Anderson (1986) also states that "Science in Japan, Agriculture search, Chemistry search and a variety of other 22 databases are available through JOIS" now. The data can be retrieved in JOIS by means of keywords contained in the JICST thesaurus.

Sugamiya (1987) reports that at present, JICST is especially concerned with the development of both bibliographic and factual databases. The centre has established on-line networks and on-line retrieval services with output in Japanese characters (Kanji).

Igarashi (1988) informs that JICST has served not only industries but also universities and research institutions by undertaking information activities such as gathering and processing STI and offering the services worldwide by JOIS.

Morita (1991) states that JOIS-II and JOIS-III have covered JICST's own databases, three Japanese industries' files, and files from foreign countries, namely, MEDLINE, BIOSIS, and INSPEC. He mentions that JICST is one of the first agencies to use Japanese character successfully in computers. He also informs that JICST's major files of journal indexes and abstracts are in Japanese, with some files in English. The files are made available through JICST's own computer network

throughout Japan. Eight (08) branches have been located throughout Japan to function as nodes, with cluster of computers in smaller cities providing access to JICST files directly, as well as through local nodes. JICST makes its on-line files available to other countries, mainly, Asian countries.

Morita (1991) and Sugamiya (1986) inform that in June 1986, JICST concluded a co-operation agreement with Chemical Abstracts Service (CAS), Columbus, Ohio and FIZ (Fachinformationszentrum Energie, Physik, Mathematik GmbH) Karisruhe, Germany, regarding Scientific and Technical Information Network (STN). STN International acts as an information channel between database producers on usage trends and joint software development. STN encourages use of Japanese databases in the West and also helps Japanese users to access western databases. Morton (1993) reports that over 145 databases are available on STN. These databases are distributed over 3 service centres and linked by 'transparent' satellite network, with common command language.

Abe (1995) mentions that JICST *Catalogue on CD-ROM* contains about 80,000 items. The JOIS-JCATALOG files are also available in on-line both in Japanese as well as roman characters.

Haon (1995) reports that from 1985-1995, a unit specialising in Japanese information offers access to databases, document supply inquiries, publications, and the use of new technologies such as machine translation, bibliometry, CD-ROM and INTERNET.

B.2.5. RUSSIA

Bondar (1985) reveals that an integrated computer-based information reference system on science and technology has been developed at the All-Russian Institute of Scientific and Technical Information (VINITI). The system provides the following kinds of information services:

1. Selective dissemination of information;

2. Issue of information publications of different types and purposes including information in machine-readable form on different subjects;

3. Retrospective search of databases on demand;

4. Fact and data retrieval in various branches of science and technology; and

5. Storage and supply of copies of published scientific documents entered into the system.

Chumakova and Polupina (1992) report that the VINITI is the main producer of the network's databases; and it is facing financial constraints, shortages of primary information sources and space.

Arsky (1995) states that the VINITI, widely acclaimed as one of the largest information centres in the world, publishes abstract journals and bibliographic databases on natural and engineering sciences. Alongwith these activities, research and development in the field of information technology is also carried out at the institute. At present, VINITI has a sufficient fleet of computers which are being used widely for tackling practical problems. Since "1970 an Automated Reference Information System for Science and Technology (ASSISTENT) has been developed. This is an integrated information system designed not only for the compilation of various information publications, but also for SDI, retrospective searching, data retrieval services, and the production of 20 databases on magnetic tapes in the field of automation and telemechanics, biological chemistry, biophysics, computer science, information science etc."(Chernyi:1977). Nesterov, et.al.(1991) mention that staff working on the VINITI system of the Russian Academy of Sciences have developed an experimental interactive system *REFERAT* for automated abstracting of documents, forming also simultaneously dictionaries of standard phrases, keywords and other word combinations.

Sulimenko and Borisova (1996) state that the Scientific Information Centre

(SIC) has its own Local Area Network, provides a wide range of services including searches of on-line and CD-ROM databases. The SIC has also set up an in-house database containing information on ecology, inorganic materials, colloid chemistry, plastics technology, chemical technology etc. The centre is fully automated and an electronic catalogue is available to provide access to the collection.

B.2.6 UNITED KINGDOM

BLEND (1982) reports that the Birmingham and Loughborough Electronic Network Development project emerged out of the concept of computer conferencing. Under this system communications may be stored after transmission and retrieved via local terminals at a time convenient to the recipient. Originally concerned with evaluating an electronic communication network as an aid to the production and submission of scientific papers, the scope of the project has been extended to the evaluation of the system for other types of scientific and technical communications also.

According to Barr (1983), it is observed that the British Library Lending Division's loan/photocopy service has been supplemented by computer requesting, links through database operators such as DIALOG, and the telephone for urgent requests. The Division's stock records and union catalogues are being automated. It's cover-to-cover translations of (mainly Russian) scientific and technical journals have been continued; and it is always in tune with relevant developments in automation and electronic publishing.

Harries (1993) states that JANET is an X.25 packet-switched network which provides inter-site access for and on behalf of the UK higher education and research community. It was initially formed in 1984 to support scientific data processing through a rationalisation of the existing academic and research networks which belonged to the Science and Engineering Research Council and the Natural

Environment Research Council, together with eight regional university based networks. The JANET provides the basic services of e-mail, remote log-in and file transfer. Brown (1994) says that the OPACs of the member institutions are normally available to anonymous remote users through a JANET connection. In August 1993, 70 UK information centres' catalogues were available in this way, including most of the larger research information centres.

Breaks (1995) inform that a new project named Super JANET has been initiated in 1992. Services provided by Super JANET includes distributed teaching, group communications, remote access, remote consultation, computational support, visualisation; and information services with the present JANET.

B.2.7 UNITED STATES

Gait (1982) reports that a research-oriented computer communications network in being developed in U.S.A. to provide file transfers, mail forwarding, access to remote databases, and other services to researchers in computer science. It is proposed to establish a central site as a co-ordination and information centre to manage the network, to co-ordinate research activity in distributed systems, to arrange for new services, and to encourage acceptance of the network.

Cveljo (1985) reveals that the scientific and technical information centres in United States are providing: (i) retrieval services, which include the quick answer queries, identification of bibliographic citations, literature surveys and extensive bibliographic searches, (ii) interlibrary loan services, which presenting, with few exceptions, make use of large regional or national on-line databases, some of which offer an automated method of on-line inter-library loan requests as, e.g. OCLC as the typical example of a system with provision for computer-controlled processing of interlibrary loans, (iii) computerised searching in a great variety of both commercially-produced bibliographic and numeric databases and in-house private

databases, (iv) instructing users in the availability and the characteristics of specialised on-line databases in the few exceptions when they themselves prefer to perform searches on their own desktop work-station computers. He also identifies the following difficulties in collection development in a scientific and technical information centre: (i) complexity in the subject areas, (ii) large numbers of choices to make, and (iii) findings out certain grey area publications. In addition, selection of appropriate software and databases continues to pose difficulties for scientific and technical information centres in United States.

Buchan (1986) states that NASA Scientific and Technical Information (STI) facility provides access to over 2.6 million documents of worldwide aerospace interest. It prepares various publications including Scientific and Technical Aerospace Reports (STAR), NASA Tech Briefs, and Spinoff. The on-line retrieval system, NASA\RECON provides access to the STI databases which consists of 16 files of aerospace information. Subject access to NASA/RECON is via the NASA thesaurus. The books and journals on the STI databases are controlled by NASA Library Network (NALNET). He also reports that the two current projects are: the development of Aerospace Information Research Network (AIRN) integrated library system and the NASA Lexical Dictionary for machine aided indexing.

Molholm, Fox and Klinefelter (1988) report that Defence Technical Information Centre (DTIC), Department of Defence, participates in the co-operative organisation called CENDI (Commerce, Energy, NASA, NLM, and Defence Information). This co-operation is vital because the five agencies of CENDI produce 92% of the federal research and development information.

Cotter (1990) outlines projections for NASA Scientific and Technical Information Programmes in the 1990s. The programmes outlined include a quality bibliographic and full-text database, emphasising electronic input and products supplemented by networked access to a wide variety of sources, particularly

numeric databases. He is of the opinion that despite budgetary constraints, there is much that can be accomplished by applying new technology creatively. Changes in process will provide a springboard for further change, making NASA more accessible and its dissemination more effective.

Bronson (1997) reports that SPACELINE, an on-line database has been developed jointly by the National Library of Medicine and NASA to collect a body of space life sciences research into a single database which is easily accessible and makes use of existing MEDLINE and Grateful Med search commands and techniques on the ELHILL system. SPACELINE covers periodical articles, books, book chapters, technical reports, conference proceedings, meeting abstracts, bibliographies and audiovisual materials. NASA contributes references from in-house files from 1961 to the present.

INTERNET

Harries (1993) states that Internet originally developed as a military network from projects funded by the Advanced Research Projects Agency (ARPA) of the US Department of Defence from 1969 onwards, and was known as ARPAnet. Gaines, Chen and Show (1997) inform that, by 1971, ARPAnet had 15 nodes connecting 23 computers, and by 1973, international connection to the UK and Norway had been created. Thus, by November 1992 nearly 8561 foreign, regional, state and local networks constituted the Internet (Harries:1993). At the beginning of 1996, the Internet constituted of some 28,000 linked networks of about 149 countries (Gayatri and Kalidas:1996), and the number of computers connected through it has grown over 9 million host computers (Gaines, Chen and Shaw:1997). Cawkell (1997) estimates that at the beginning of 1997, there were 60 million users on the Internet and it is doubling every year.

The Economist (1995) reports that in North America alone, the Internet has

over 30 million users, about 200 daily newspapers, 600 magazines, over 1000 newsletters and other products. These are available on-line via communication networks and Internet.

Singh and Kalra (1996) remark that the value of networks cannot be underestimated. They also report that presently, e-mail, ftp, telnet, http, gophers, WWW, on-line catalogues, directories, guides, databases, e-journals, e-newsletters, discussion lists, bulletin boards, Usenet news-groups, Archie, Vernica, Wais, Mosaic, Netscape, etc. services are available via Internet, which enable us to provide massive access to global information. Gaines, Chen and Shaw (1997) also support this findings. Collins (1997) reports that there are currently numbering over 500 search engines in the world which are assisting searchers to navigate the WWW, some of the important engines are: Alta Vista, Lycos, Magellan, Open text, Exite, Yahoo, Web Crawler, InforSeek Guide, HotBot, I-Explorer, etc.

Lynch (1998) reports that two major initiatives are emerging in Internet environment: The Internet 2 and Next Generation Internet (NGI). At network services level, there is real convergence between the thinking of Internet 2 and NGI programme. They identify two key new areas are quality of services (QoS) and multicasting.

The next chapter presents the methodology used in the study.

CHAPTER THREE

METHODOLOGY

To aim at studying the role of Documentation Centres in communication and dissemination of scientific and technological ideas in Bangladesh, the present study identified two sectors, namely, Documentation Centres in Bangladesh and their users. The detailed methodology used for this study is discussed in the following sections.

A. OBJECTIVES

The objectives of the present study are:

1. To assess the role of Documentation Centres in economic development;
2. To examine the present situation of Documentation Centres in Bangladesh;
3. To identify the problems and prospects of Documentation Centres in Bangladesh;
4. To ascertain the channels of communication and dissemination among the scientists and technologists in Bangladesh;
5. To examine the role of networking of Documentation Centres in communication and dissemination of scientific and technological ideas; and
6. To evaluate the existing networks and suggest changes and improvement.

B. HYPOTHESIS

The hypotheses of this study are whether-

1. Documentation Centres in Bangladesh differ significantly in their number of users, collections, facilities and services;
2. There is no significant difference in the use of Documentation Centres by age, gender, qualifications and status of the scientists and technologists;
3. More dependence on informal channels by scientists and technologists is likely to result in lesser use of Documentation Centres;
4. Lack of linkages among Documentation Centres necessitates networking for accelerating the process of communication and dissemination of information.

C. METHODOLOGY

The present study has adopted survey method for studying the existing situation of Documentation Centres in Bangladesh and the needs of their users. The survey was conducted with the help of questionnaires supported by observation and interviews. The main reason for choice of questionnaire method was that the area of population sample was quite large. Another reason was that this survey includes various statistical data and information which were not possible to be acquired by observation or interview method alone.

1. *POPULATION AND SAMPLE*

a. Documentation Centres

This study selected all those scientific and technical Documentation Centres in Bangladesh which had been providing documentation and information services in large scale and were having the word 'Documentation' or 'Information' in their name. It was found that there were in total six such scientific and technical Documentation Centres in Bangladesh (Details are shown in Appendix-I). All these

six scientific and technical Documentation Centres in Bangladesh were included for studying the existing situation. Questionnaires were served to all these centres and most of them were collected personally and some of them were received through mail. The response rate is 100 percent.

b. Users

There are six scientific and technical Documentation Centres in Bangladesh (See Appendix-I). Out of these, SAIC is providing services only on institutional basis and it is not open for individuals. The other three, namely, BANSDOC, AIC, NHLDC are providing services to the scientists, technologists, researchers, teachers and students spread all over the country. It was therefore, found difficult to assess the needs of the users for the purpose of this study from these four centres. So, the researcher had no other alternative but to select two remaining scientific and technical Documentation Centres, namely, DISC and FRILDOC which are providing services to the individual scientists and technologists who work there. In these two cases, it was easier and more convenient to identify the users and assess their needs. DISC is attached to International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), Dhaka and FRILDOC is attached to Fisheries Research Institute (FRI), Mymenshingh.

All 246 scientists and technologists of ICDDR,B and FRI irrespective of age, gender, qualifications and status (rank) were selected for user survey. Out of these, questionnaires were administered to only 220 scientists and technologists as the rest were either abroad or on long leave. Out of 220, only 121 scientists and technologists filled and returned their questionnaire correctly representing 55 percent response rate which is adequate for an empirical study. The details of the population and samples chosen are shown in Appendix-II.

2. *DATA COLLECTION TOOLS*

Two full length questionnaires were designed for conducting the survey. One was to measure the present status of scientific and technical Documentation Centres in Bangladesh. It consisted of three parts. The first part entitled 'organisation' contained general information about the organisation, namely, identity, year of establishment, organisational links, type of organisation and level. The second part entitled 'facilities' contained questions relating to area, staff, budget, holdings, users, equipments, computers and other infrastructural facilities. Third part entitled 'services and products' contained various services, publications and products.

The other questionnaire was to measure the needs of scientists and technologists in Bangladesh. This questionnaire consisted of two parts. The first part of the questionnaire, entitled 'Personal Data', aimed at collecting background data on such aspects as age, gender, educational qualifications, present position/status and organisational affiliation. The second part consisted of information needs, information channels, information sources, and information about the documentation centres and services.

The questionnaires contained a combination of open-ended and closed-ended questions with various types of rating scales. The scales used were as: 5=Always, 4=Frequently, 3=Occasionally, 2=Rarely, 1=Never; 5=Very good, 4=Good, 3=Fairly good, 2=Poor, 1=Very poor and some other different point scales from 1 to 6 depending upon the type of variables .

3. *DATA COLLECTION*

The researcher went to Bangladesh to conduct the survey in July 1996 and in October 1998. At first the researcher contacted the head of each Documentation Centres by telephone and informed them about the research. Then the survey package was sent to them by mail, including a covering letter, and a stamped

self-addressed envelope. After three weeks, a follow-up reminder phone call was made to the heads of non-responding Documentation Centres. After six weeks, a second follow-up reminder phone call was again made to the heads of remaining non-respondents Documentation Centres, and lastly, the researcher personally visited the centres to collect the questionnaires. The survey was conducted during July 1996 to October 1996. The observation and interviews were conducted in October 1998.

4. *DATA ANALYSIS*

The data collected from the targeted respondents through questionnaires have been analysed and interpreted using statistical techniques, namely, Proportion, Mean, Analysis of variance, Factor analysis with varimax rotation and Karl Pearson's coefficient of correlation. These have been computed by using software named, Statistical Package for the Social Science, namely, SPSS PC 4.0.1 (1990) version. To compute data by the SPSS PC software, the researcher has followed the following steps:

- coding of all the questionnaires after editing;
- data input in worksheets;
- feeding data on the computer;
- conducting validation cheeks of data to make sure that it has been duly and correctly entered on the computer;
- preparing programme to compute data; and
- framing output tables.

The results and interpretation of the study have been presented in the chapter numbers 5, 6 and 7.