INTRODUCTION

We are living in an information world. This has come about because of the unbelievable scientific and technological progress and the accompanying stresses and strains of society. So much information is being generated that we are confronted with 'information explosion', 'information pollution' and 'exponential growth' of information. This is causing concern on the communication, distribution, availability, access, and exploitation fronts of information, particularly so in science and technology. Management of information is thus drawing greater attention than ever before.

IMPORTANCE OF INFORMATION

The crucial role that information plays can be gauged from the vast areas of human activities in which it finds applications that include: growth of knowledge and wisdom, decision-making and management, research and development, manufacture and industry, education and training, and academic writing.

Information-knowledge-wisdom:

Human progress has become possible because of the existence and awareness of knowledge created in the past. Knowledge passed on to us from past generations, cultures and societies reacting with the present minds creates new knowledge. The basis of knowledge is information. Information which is the result of a meaningful response to a stimulus, when correlated, synthesized and stratified during the course of time becomes knowledge. Knowledge applied and tested over a long period of time by a continuous stream of minds resulting in its acceptance as truth, becomes wisdom. Thus, wisdom is a part of human heritage. Of course, wisdom once accepted need not be valid to all times and to all societies; it could differ from culture to culture, and from age to age. By subjecting a body of information or knowledge over a long period of time to experience, testing and thinking, knowledge may get extended, modified, created or all together discarded, thus affecting wisdom and society.

Decision-making

All voluntary actions are the results of decisions taken by an individual or a group. Similarly, management is said to be decision-making. To be able to make a wise decision, one should be aware of all the facts concerning the situation or the problem pertaining to which decision is to be made. This means information should be available to the decision-maker. Sound decision-making also depends on the information made available being relevant, accurate and up-to-date. It might also involve foreseeing.

Research and Development

Some of the basic features of scientific research are: invariability, i.e. being verifiable;
openness, i.e. available to all those who can make use of it; relatability, i.e. inter- and intra-relationship of subjects; applicability for material development; growth, i.e. capable of further extension of frontiers of knowledge. Communication is common to these features and information constitutes a vital input.

Industry and Manufacturing

A major impetus to scientific research has come from manufacturing, which applies the results of research to production of goods and development of new products. Innovation is the cornerstone around which an industrial enterprise survives today, and can cope up with competition. Innovation is possible through access to latest information and its transfer into physical products and processes.

Education and training

The essence of education is the imparting of knowledge, which in a way is same as transfer of information, primarily through a teacher. A recent trend in education is the introduction of teacher substitute in place of teacher - student situation, resulting in correspondence courses (open universities), programmed instructions, and audio-visual texts. In this context, the importance of information is much more, as the emphasis is more on newer media of communication and self-study than on the teacher. Training on the other hand is concerned with equipping an individual to do a job, i.e. transfer of information/skill pertaining to the job through practice.

Academic writing

Writing, apart from its value to others, is a form of self-expression, which provides immense psychological satisfaction to the writer. Unless one has access to information, academic writing suffers, thereby affecting education.

Individuals, government and society

Living in a technological world without having at least a rudimentary knowledge of technology of things immediately surrounding one is hazardous; hence the need for information to keep the individual informed.

The government is concerned with raising the standard of living and eradicating poverty. Unless full advantage is taken of the capabilities of science and technology, attainment of this objective will remain a dream. Ultimately, it is the government which provides and controls the direction of scientific and technical research. Without communication of information, research and development is unthinkable. Government is equally responsible for development, maintenance and servicing of information for national development.

In recent years, the impact of science and technology on society has been so intense that the norms of social behaviour are changing fast. For right or wrong, it is information which is bringing this change. It is important to ensure that the society benefits from information, and also information is put to maximum use.

USES OF INFORMATION

Information has only dormant value unless it is used. One uses information sources either to acquire or to retrieve specific information or browse to discover new facts. Information itself is used to (a) support or disprove a theory; (b) describe and/or predict; (c) create new ideas; (d) translate an existing idea into a physical development; (e) modify an existing material entity or phenomenon; (f) recreate and; or (g) get psychological satisfaction.

The purpose for which information is acquired or used by the individual indicates his role and decides the type of information he seeks. A scientist generally needs latest information of original nature, whereas a development engineer is more concerned with information of applied nature, preferably structured and illustrated. Similarly, a manager's interest is more likely to be in information on marketing, production, government policies and data type, while an educator seeks information leading to knowledge.

Information Chain

Use of information presupposes its availability and supply. An understanding of the pattern
of information flow/transfer will help us in better organization and use of information. Fig. 1 shows the present pattern of the information chain.

PROBLEMS IN INFORMATION HANDLING/TRANSFER

The phenomenal increase in scientific and technological research and the enormous manpower employed in such activities, coupled with the high growth rate of industries and defence activities have changed the whole complexion of information generation, communication and transmission in the last 30 years. Recent developments in computer and communication technology have given a new dimension to this activity. While the role of information is becoming more and more crucial, its collection, organization, dissemination, and usage and becoming more complicated. This is mainly due to (a) bulk or quantity of information produced; (b) different languages in which it is communicated; (c) proliferation of transmission media; (d) uneveness of quality, (e) security restrictions; and (f) high rate of obsolescence.

Bulk

So much information is being produced in science and technology alone that the traditional methods of managing information flow have reached almost the breaking point. It is estimated that currently 4.5 lakh research papers are published every year, and this number is growing continuously. Chemical Abstracts covers about 4.5 lakhs items a year, Biological Abstracts, 2.5 lakhs; Physics Abstracts, 1.65 lakhs; and Engineering Index, about 1.05 lakhs.

The problems of locating, selecting, collecting, processing and disseminating information are becoming complex.

Language barriers

Publication of research results in different national languages is a barrier to flow of information. It is estimated that of the total output of scientific and technical literature, English accounts for about 50%, Russian 20%, French 10%, German 15% and Chinese 2%. Access to this literature is possible either through learning various languages and/or through translations. Since an individual's capacity to learn languages has limitations, the only practical solution is through translation. The ultimate solution lies in machine translation, though its large-scale use will take a long time to become possible.

Proliferation of Journals

Journals as media of research communication are likely to retain their position for a long time. The current estimate of the number of journals in science and technology varies from 30,000 to 50,000. If we add to this the stillbirths and post-natal deaths of journals, we get an idea of the proliferation. Every year new journals are born in various disciplines. This prolific growth is choking the communication channel. Separating worthwhile information from the chaff, and identifying original contributions from repetitive ones has become a serious problem, particularly given the limitations of human mind to grasp information and the time available.

Un-eveness of Quality

Information being the product of intelligence, it is extremely difficult to adopt suitable quality control or quality assurance measures. The refereeing system devised to ensure quality and reliability succeeds to a limited extent, and is not foolproof. The problem is further compounded by the bulk, increasing cost of processing, and the different need patterns of users.

Currency

The rate of obsolescence of information in science and technology is assuming alarming
proportions. Information people already talk in terms of half-life of information, which is about 5 years in the West. Probably we are reaching a stage where much of the information will become obsolete before it is published and reaches the users. However, what is obsolete in one context still remains current in another, depending upon the stage of development reached by a country.

Security

Though openness is a feature of scientific research, it does not always work so in practice. This is particularly so in defence research and industrial research. The dilemma is that of deciding what information and how much of it to control without affecting security, at the same time allowing reasonably free flow.

APPROACH TO INFORMATION MANAGEMENT

Information, because of its importance to national development, is considered a national resource. To make full use of this resource, it needs to be managed properly. Some of the problems encountered in managing information have already been discussed. There is no single approach to the overcoming of all these problems. A variety of strategies, methods, machineries, and agencies are employed in the management of information.

Strategies

The strategies centre round the characteristics and inherent properties of information. Some of the characteristics are that information can be analysed, grouped, structured, surrogated, stored, retrieved, extracted, abstracted, summarized, correlated, interpreted, cited, reproduced, translated, disseminated, suppressed and destroyed. All these characteristics are utilized to bring order, enhance use and control the flow of information. Use of citing and correlation property for the development of citation index, abstracting and surrogate characteristics in the generation of secondary publications, are examples.

The exploitation of subject inter-relationship and grouping characteristics minimizes the efforts required for selection and collection of information. Probability distribution (Bradford-Zipf) study enables us to identify the most relevant or core publications in a given subject field.

Methods and Machines

Classification and indexing techniques aid in the storage and retrieval of information/documents. Abstracting provides access to the vast reservoir of information disciplinewise. Various reprographic devices and equipment enable us to reproduce published literature in suitable forms and sizes, thereby making supply and distribution quicker and easier. Computer type-setting has cut back printing time.

The real breakthrough in information management has come from computer and communication revolution. Theoretically, it is no longer necessary for each unit to collect, store and organize information; through central processing and storage one can have access via terminals. Conferences and meetings can be conducted through video-telephones and hook-up. Paper books are being gradually replaced by electronic books. Though progress along these lines provides solutions to information problems, it would take a very long time for these to reach the common user in India.

Information handling agencies

Mere existence of literature and information will not be of much use unless they are collected, organized and made available to the needy; this involves an intermediary function. Strategies and machines can only help the user and the intermediary, but cannot replace the latter, at least in the near future. The intermediary function is being discharged by agencies such as libraries, documentation or information centres, information analysis centres and the like. Specialization in this field has lent prestige to the profession of librarianship and information scientists. Information is also becoming a product, and information supply a business.

Library

The primary function of a library is collection, maintenance and servicing of books, journals
and other forms of documents. A librarian’s major concern is that of collection building and reference service. With increase in the output of newer forms of documents; phenomenal growth in the production of books, journals, reports, patents, standards and theses; and growing subject specialisation, organizing and managing libraries has ceased to be a simple operation.

**Documentation Centre**

It is an extension of the traditional library functions, with the collection emphasis moving from books and journals to articles, reports and other special materials. The services are geared to meet intensive individual and group information needs rather than general loan and reference needs. Other additional functions discharged by such centres are translation and reprographic services.

**Information analysis centres**

These centres concentrate on information rather than documents. Information from various sources, both formal and informal, is analysed, evaluated and repackaged. Information is supplied to meet the specific requirements of the user. The output consists of reports, reviews, forecasts, abstracts and data analysis and interpretation.

**Personal Information Gathering**

The user is the best judge of his requirements. Apart from receiving information through institutionalised agencies, such as libraries, the users have their own private channels for obtaining information. Compared to the institutionalised channels, personal channels are direct, more effective and most fruitful. Information is gathered through personal communication, exchange of preprints, meeting colleagues, attending conferences and symposia or through ‘invisible college’ membership. Many of the creative scientists, engineers, managers and educators built up their own personal information systems in the form of diaries or index cards. However, they can no longer afford to have personal libraries in their homes, as in the past.

**USER AND THE MEDIATOR**

The ultimate objective of any information agency is to fully meet the requirements of the user. To what extent the agency succeeds in fulfilling this is the sole criterion of measuring its effectiveness. To succeed in this task, the intermediary, whether he a librarian or an information scientist, must be resourceful, have sufficient subject background, understand the user and his needs, well acquainted with all the sources of information, and skilled in various information processing techniques.

**REFERENCES**