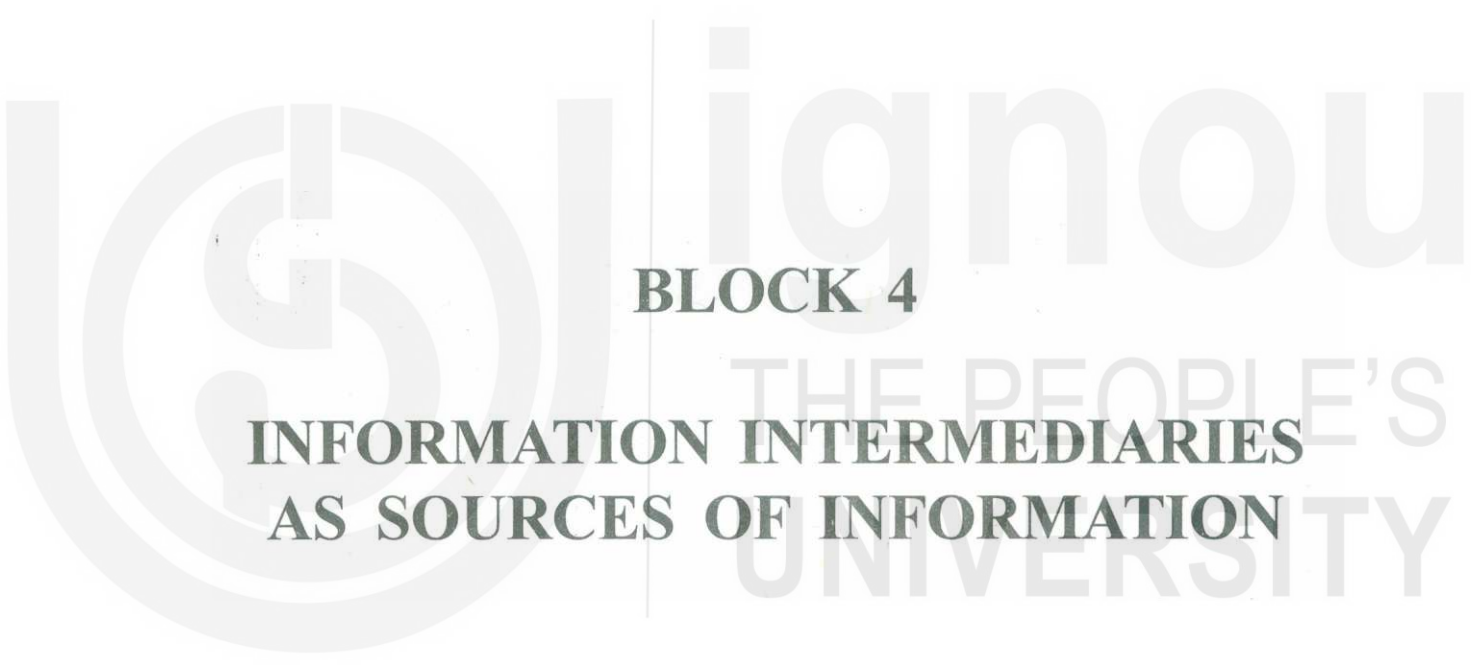


The background of the page features a large, light gray watermark of the Open University logo, which consists of a stylized 'U' and 'O' intertwined, followed by the text 'Open University' and 'THE PEOPLE'S UNIVERSITY' below it.

## **BLOCK 4**

# **INFORMATION INTERMEDIARIES AS SOURCES OF INFORMATION**





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## UNIT 14 LIBRARY AND INFORMATION PROFESSIONALS

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### Structure

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### 14.0 OBJECTIVES

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After reading this Unit, you will be able to:

- visualise the wide spectrum of library and information professionals and enumerate their categories;
- learn the various types of information that these people generate, gather, record, process, preserve, and disseminate for the awareness and use of others;

- tap these resources for obtaining expert's opinion, knowing the latest developments in the field, clarifying many of your doubts, and widening the horizon of your awareness; and
- realise that the spectrum of library and information professionals is pretty wide and includes administrators, technical personnel, educators, service providers, and so on.

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## 14.1 INTRODUCTION

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By the term *profession* we mean a paid occupation especially involving training and a formal qualification [COD]. Thus a *professional* means a person engaged in an activity as a paid occupation rather than as an amateur [COD]. Hence, by the term *library and information professionals* we mean those professionals who are engaged in library and information activities as a paid occupation.

Library and informational professionals have been there since ancient times. It is they who built up the famous libraries of Alexandria, Nalanda, and others. It is through them that knowledge has been preserved in the world throughout the ages. It is again they who have made information available to the people and kept the urge for knowledge among people burning.

You have already learnt about the various media wherein information at first gets recorded and then disseminated. You have also realised that it is through these media information has survived for ages and will survive in future too. With the passage of time newer and newer media are coming up demanding less and less storage space, promising longer durability, and providing better facilities for quicker duplication. It may be noted that it is because of these media, education has spread all over the world, encompassing people in every walk of life.

Apart from documentary sources, there are non-documentary sources also which include among others libraries, information centres, documentation centres, learned organisations and institutions, national and international information systems, and humans such as consultants and other resource persons. You have read about them already.

Through content analysis of information we can portray its real situation and place it in proper perspective. Information can be customised to the user's requirement. Citations forming part of a document allow ample scope for the analysis and generation of information products. To access information present in a documentary and some non-documentary sources we take the help of certain aids, about which you have already gathered some idea.

Nowadays every person in the world deals with information. Even illiterate farmers use information to grow crops in the field, sell their products at the price fixed by the authority, pass on information to others whenever needed and do many other things involving information. Here, we are not going to cover all categories of people dealing with information, but only those who earn their livelihood dealing mostly with recorded information, i.e. library and information professionals who form an important component in the whole information transfer chain.

In the bewildering multitude of information professionals one may easily get lost and fail to establish links with one another to identify personnel of the same community. Here, we intend to map the zones that different categories of information professionals occupy in the broad canvass of knowledge and depict their linkages. Needless to say, in many cases, the area of one category overlaps with another.

While describing each category of information professionals, we shall try to highlight the role, each one plays as a source of information. We shall neither talk about their qualifications, nor about their training.



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## 14.2 LIBRARY PROFESSIONALS

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Library professionals are generally involved in the process of acquisition, processing, organising and maintaining documents in a library and providing various types of information services based on these documents and their experience. In certain cases, say, in a small library, all these activities are performed by a single individual. In certain cases, an individual may be involved only in a single activity, say cataloguing. Generally, these personnel are trained through certain institutions like universities and associations, and are paid for the jobs they perform.

In our country, many libraries are being run by untrained persons. According to definition, these persons do not fall under the category of library professional. Similarly, accounts staff, clerical staff, class four staff like security guards, cleaners are not considered as library professional. Technical staff like binders, cameramen for microfilming, and photocopier operators are also not included in this category.

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## 14.3 CATEGORIES OF LIBRARY PROFESSIONALS

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Library professionals include among others library administrators, classifiers, indexers, cataloguers, reference librarians, classificationists, teachers of library and information science, and thesaurus constructors. We can also include librametrician, bibliometrician and bibliographer in this category. The library professionals can also be categorised according to the institution they serve, e.g. school librarian, college librarian, and university librarian. Categorisation is also possible according to the subject, i.e. medical librarian, law librarian, and so on.

You are aware of the functions of many of these personnel. Hence, we shall describe them briefly in this Unit. A person in charge of a library is called a *librarian*. Sometimes, he/she is also termed as *library manager*.

### 14.3.1 Library Administrator

A library administrator is responsible for the administration of a library. The head of a library is usually designated as chief librarian and his/her subordinates as deputy librarian, assistant librarian, etc. Sometimes, he/she is simply called a librarian, a library manager or a director. He/She possesses expertise in planning, organisation and management of various activities and services of a library and is considered to be a good source of information in these areas.

### 14.3.2 Classifier

A classifier generally classifies books following certain scheme of classification, say Dewey Decimal Classification. While classifying, first of all the classifier has to ascertain the subject the book is dealing with. For this purpose, he/she has to go through the title, contents, and sometimes even through the text and index of the book. This apart, many a time he/she is to consult reference books like dictionaries, encyclopaedias, gazetteers and who's who. This process helps him/her to learn the topography and ramifications of a number of subjects bit by bit. A classifier of a general library gradually becomes knowledgeable practically in all subjects. While classifying, sometimes he/she encounters books on subjects that do not figure in the classification schedule giving an indication that the subject may be new. Thus, the classifier becomes aware of a new subject much before its entry in a classification scheme, dictionary or an encyclopaedia. He/She also comes to know about the word denoting the new subject. Thus, a classifier knows better than others about the books on new subjects



that have entered a library because he/she has to spend more time on the book while deciding its class number. Needless to say, this process helps him/her to remember the book for a long time and turns him/her into a good source of information about books available in the library, the subjects in which the library is strong and weak.

### 14.3.3 Cataloguer

You all know that one who catalogues documents following a catalogue code or a set of cataloguing rules is a cataloguer. While cataloguing, a cataloguer gathers information about the title, author, collaborator, edition, imprint, collation, ISBN, price, etc. of the book. He/She also gathers information usually from the class number about the subject of the book. In the course of his/her work, a cataloguer gradually comes to know about the authors writing books, the subjects in which the library is becoming strong or weak, the publishers renowned for publishing books in particular subjects, etc. In these areas, the cataloguer becomes good source of information.

### 14.3.4 Classificationist

One who designs and builds up a scheme of classification on sound principles is a classificationist. For example, Melvil Dewey, S R Ranganathan, H E Bliss were all classificationists. There are two types of classificationists: general and specialist. A general classificationist builds a scheme of classification covering all subjects. On the other hand a specialist classificationist builds up a scheme on a particular subject, say education. A classificationist is an expert not only in the principles of classification but also in epistemology. He/She studies the origin, nature, growth, proliferation and limits of human knowledge; does research as to how a new subject comes into being, how it proliferates into branches and sub-branches, and how a particular subject decays. They also study the relationship of various subjects. The structuring of knowledge and fitting every component of knowledge in that structure also figure within the purview of their expertise. Expertise in all these areas makes them to be useful sources of information on different aspects of classification and knowledge.

### 14.3.5 Indexer

Since long, various types of indexes are being provided in documents to locate information using author's name, title of the document, key term, geographical name, chemical formula, etc. With the advent of computers, computer-aided subject indexes like KWIC, KWAC, and KWOC have also come into being requiring least human involvement.

An indexer compiles indexes based on some principles, guidelines and tools. To aid indexers standard lists of subject headings, thesauri, etc. are being developed and updated from time to time. Indexing systems like PRECIS, POPSI and Chain Indexing have also emerged. Indexing does not always prove to be a simple job. In compiling some indexes like formula index in chemistry subject knowledge becomes an essential prerequisite.

An indexer who has been continuously indexing for years knows how a subject is developing, proliferating into its various branches, and building up linkages with other subjects. He/She also becomes an expert in compiling and consulting indexes and using indexing tools like *Library of Congress List of Subject Headings*, *Thesaurus of Engineering and Scientific Terms*, etc. Such people prove to be highly useful in providing expert advice on indexing and solving various indexing problems.

### 14.3.6 Reference Librarian

All of you have studied reference service in the BLIS programme and learnt about the qualities, qualifications, experience and job requirements of a reference librarian.



We are not dwelling up on these aspects of a reference librarian here, but highlighting the role he/she plays as a powerful information source.

In response to the demand of users, a reference librarian has to consult more books and documents compared to other staff of the library. In this process he/she becomes more knowledgeable about the contents of books held in a library and provide answers to queries from unimaginable sources. To illustrate this point a few real examples are being cited here. In mid-1960s, B S Kesavan, the then Director of INSDOC (now NISCAIR), was interested to find out the address of an Australian librarian. Internet was non-existent in those days. Who's Whos did not provide the answer. One very young staff providing reference service basing the nucleus of National Science Library searched out the information from the *Australian Library Journal*! In early 1980s, a query was received from an engineering institution at the National Science Library, New Delhi as to the meaning of 'tribology'. All possible reference sources including the latest dictionaries were silent about the word. It was thought that the word might have been derived from the word 'tribes'. But the enquirer pointed out that he/she knew this much that it was an engineering topic, and had nothing to do with tribes. Finally, one senior staff of the Library ferreted out the information from a booklist informing about new books. The publication recorded a conference proceeding on the subject [probably it was the first conference on it] where the definition of tribology was given. The word connotes the science and technology of friction! These examples show that a reference librarian should be well read and well informed, person having a fair knowledge of information sources.

#### 14.3.7 Library and Information Science Teacher

All of you have seen library and information science teachers. They take classes in various courses of library and information science and many of them guide research students. They also write textbooks, course materials, etc. In our country, a library and information science teacher generally teaches more than one subject. However, specialisation is gradually setting in. Today you may find that all library and information science teachers cannot teach bibliometrics or computer applications. Only specialist teachers are teaching those subjects.

A teacher is not only an expert in the subject he/she teaches, but also knowledgeable in various methods of teaching, and courses and curricula of various universities and institutions teaching the subject. Many of the teachers suggest the research topics to the students. In some foreign universities, e.g. University of Malaya, a teacher announces in advance the research topics in which he/she can guide the students for doing their project works. Here, a student gets a very good opportunity to select the topic of his/her choice.

#### 14.3.8 Thesaurus Designer

A person who designs a thesaurus is called a thesaurus designer. This is a new group of professionals that emerged several decades ago especially with the advent of computers in the field of library and information science. Thesauri being developed for information retrieval purposes are different from Roget's Thesaurus. Designing and construction of these thesauri require specialised knowledge of thesaurus construction as well as the knowledge of the subject for which the thesaurus is designed. For deciding descriptors for the thought content of a particular document, and for its subsequent retrieval from a computerised database, a thesaurus provides immense help.



A thesaurus constructor knows all the essential principles and methodologies of thesaurus construction and thereby can guide or impart advice to others for the construction of a thesaurus.

#### **14.3.9 Bibliographer**

Compilation of bibliographies is one of the important library activities. Many libraries of the world, especially special libraries provide bibliographical services to its users. While preparing a project report or pursuing research work, a student is also to compile bibliographies or look for already existing bibliography on that subject. Compilation of a bibliography is an interesting job and helps the compiler to go through numerous sources, some of which might be rare, uncommon, or totally new. Thus, the process of compiling a bibliography makes the compiler an expert about the various types of sources of information available on a particular topic and also about the methodology of compilation.

#### **14.3.10 Librametrician**

An expert on librametrics is termed as a librametrician. The word 'librametrics' was coined by S R Ranganathan in 1949. Later on A Neelamegha elaborated its scope. Librametrics is a discipline that measures library activities, library collection, personnel, building, furniture, etc. Librametric studies quite often entail mathematical and statistical applications. Librametricians are the sources of information relating to quantitative studies of various library objects and activities.

#### **14.3.11 Bibliometrician**

An expert on bibliometrics is called a bibliometrician. Though the bibliometric study initiated more than a century ago, it started developing only after the World War II. Like librametrics, it also deals with measurement or quantification and involves mathematical and statistical techniques. In this case, the objects of measurement are the documents and their contents.

Bibliometricians study among others the growth of literature in a subject, scattering of literature of a subject in various types of documents, ranking of journals from various angles, ranking of authors of a subject depending on their output, active life of literature, obsolescence, and so on. They can easily find out the extent of use of various types of documents in a library, weak and strong areas in terms of collection of a library, rate of growth of a library, and so on. Bibliometric study has picked up quite well in our country. Every year a good number of papers are emanating from India.

Bibliometricians can provide answers to many queries relating to the ranking of periodicals in the world, important contributions being produced from a country, rate of growth of literature of a country, use of journals and other documents in a library, various indicators of periodicals like impact factor, immediacy index, and so on.

#### **14.3.12 Content Developer**

With the advent of Internet, engendered the idea of content development. It involves designing, creation, and deployment of the content in cyber space. Usually it includes text, sound, images, animation and provision for interaction. Suppose you want to develop a website for your institution, first of all you will have to think about the content of the website, that is, the information you intend to place in the website for your institution. Normally, you would like to include among others the following

information about your institution: name, postal address, telephone no., telegraphic code, e-mail address, fax no., year of foundation, name of the head of the institution, names of various divisions and their respective heads, history, objectives, functions, achievements, special facilities available, library and the services being rendered by it, and publications. The textual matter relating to all these will have to be written by somebody and authenticated by the head or someone nominated by him/her. You may like to make your website colourful. Hence, you will also have to decide the colour of the various parts of the text. Also you are to decide the format, types of fonts, and the font size for various headings and other parts of writing. You can include pictures of your institution, various divisions, important personnel and so on. Taking care of all these, you will make the text ready. If you want to include some speeches along with the sound, you can do so. Some portion of the website can be animated. The provision for interaction can also be there. The person who has visited your website can be requested to sign and give his/her opinion about your website. Many might give their opinion and some good suggestions whereby you can improve upon your website.

The job of a content developer has been described above very briefly. There are specialised courses on content development which one may undergo to gain required knowledge about the same. Normally, a content developer is a computer professional and he/she possesses sound knowledge about the software packages available for content development.

In many of the LIS courses 'Content Development' has been included as one of the courses.

A content developer also acts as an information source in as much as he/she can give advice about various facets of content development to the clientele.

### Self Check Exercises

- 1) Explain why all persons working in a library are not called library professional.
- 2) Name different categories of library professionals.
- 3) Describe for what type of information you will approach a classificationist.

**Note:** i) Write your answers in the space given below.

- ii) Check your answers with the answers given at the end of the Unit.

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## 14.4 INFORMATION PROFESSIONALS

Informational professional include those who gather, record, process, organise, preserve, retrieve, disseminate and sometimes generate information. They also provide various information services.



Now, can you think of anybody who does not gather information. If you observe deeply, then you will find that each one of us gathers, records, processes, preserves, retrieves, disseminates and generates information. Thus, every one in the world can be termed as information personnel. However, we are concerned with only those information personnel who deals with documentary and non-documentary information and who have been trained in information science and are paid for their jobs.

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## 14.5 CATEGORIES OF INFORMATION PROFESSIONALS

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Having some idea about the information professionals, we can now go ahead with their categorisation and describe their respective activities. We will be discussing in the following sub-sections the different groups of information professionals e.g., information generators, gatherers, processors, recorders, disseminators, translators, condensers, retrievers, quantifiers and preservers.

### 14.5.1 Information Generators

Researchers, inventors, innovators, discoverers, thinkers, authors, planners, policy makers, decision makers, judges, and many others are generators of information.

A scientist observes, thinks, hypothesises, designs and conducts experiments, records the results, and finally draws conclusions. The entire process may give rise to new findings leading to generation of new information.

After a great deal of hard work, sometimes lingering for a number of years, an inventor develops a new machine, equipment, tool or something else. He/She discloses his/her invention through a patent, which contains details of the invention. The inventor continuously strives to enhance the productivity and efficiency of the machine. The success in his/her attempts, needless to say, gives rise to new information.

An astronomer while scanning the night sky with his/her telescope may encounter a comet not seen before. The moment he/she informs the media about his/her finding, information generates and the world comes to know about it. A team of doctors while investigating a new epidemic may chance upon a new virus that may lead to generation of copious information.

The thinking of philosophers over the ages has given birth to a large number of philosophical systems all over the world. Each philosopher developed their views after a great deal of thinking and made that known to people helping generation of information. Other philosophers engaged their minds on those views and recorded their sagacious comments. Following this process developed the subject of philosophy.

The output of an author's mind can be seen in a variety of forms like books, articles, paintings, drawings, sculptures, and so on. In many cases an author gleans information from various sources, weave them together, adds something from his/her own thinking, experimentation or experience and brings out a book or an article. The new information content of the book may vary widely. For example, Ranganathan's *Prolegomena to Library Classification* harboured a huge amount of new information when it appeared for the first time.

A reputed industrialist planning for a new enterprise or new product, a multinational giant planning to start a joint venture in a developing country, an internationally renowned athlete planning to build a modern stadium, etc.—all these generate information the moment a particular plan is disclosed. Quite often these types of information figures in mass media – locally, nationally and even internationally.



The decisions by the head of a state, prime minister, or others in top positions almost always generate information of national and international significance; the moment the decision is made known. The major decisions of the top executives of reputed industrial houses, business concerns, institutions and organisations also generate information of significance.

There are many others in our society whose activities, good or bad, at times hit the headlines of newspapers. Some information may be important for an individual or a family only, for example, the birth of a child. Some others may be important for the local community, say the election of the head of the village panchayat. Everyday substantial amount of information generated (say, the speech by the prime minister of a country), assumes national and international significance. From the professional point of view, we are mostly concerned with the information of national and international importance, and sometimes of local importance.

### 14.5.2 Information Gatherers

Journalists, reporters, correspondents, detectives, spies, police, compilers, enumerators, etc. are information gatherers by profession. All these people receive training for the job they do. Of course, there are many others in the society who gather information for various purposes. For example, a student gathers information to enrich his/her knowledge, a lawyer gathers information from his/her client to defend his/her case, a doctor gathers information from his/her patient to diagnose the disease, and so on. However, we shall discuss under this category only those personnel whose profession is to gather information.

#### Journalists

**Reporter :** We have earlier seen that some information is generated through human activities. Whatever may be the case, a reporter is to collect information depending on its importance and report it to the press along with photographs and other associated materials if that is possible. One moral responsibility that lies with the reporter is that the information he/she passes on to the press for wider dissemination should be authentic to the best of his/her knowledge. To establish the authenticity of the report, he/she has to check and crosscheck the information at various vital sources. Suppose, due to police firing some persons have been injured. When the reporter reaches the spot, he/she is likely to get different figures from different persons as to the number of persons injured and different views as to the cause of firing. To establish the actual number of persons injured, he/she may have to go to the nearby doctors and hospital(s) where the persons have received first aid or have been admitted for treatment. He/She may also visit the concerned police station to ascertain the number of persons injured and the cause of firing. He/She may also interview the injured people themselves, the people present at the scene, local political leaders, and other reliable sources to build up his/her entire report. Hence, for the information of a particular incident, a reporter proves to be a very good source of information.

A reporter can do this because of the training he/she has received. The same is the case with correspondents, detectives, spies, and so on. All are trained to do their respective jobs.

A general reporter cannot handle all types of information. For example, a reporter who is handling matters relating to trade and commerce, is unlikely to be in a position to handle scientific matters. Hence, specialist reporters have emerged in response to the necessity. Today we have sports reporters, science reporters, trade and commerce reporters, military reporters, legal reporters, and so on. These reporters



are employed on the basis of their background knowledge, qualifications, and experience. For example, a science reporter, normally possesses science background. Similar is the case with others. These reporters report on the area of their specialisation, and generally possesses sound and very up-to-date knowledge in their own fields. As such, they constitute very good source of information.

### Self Check Exercises

- 4) Who are the generators of information?
- 5) Explain how a reporter tries to authenticate the information he/she gathers.

**Note:** i) Write your answers in the space given below.  
ii) Check your answers with the answers given at the end of the Unit.

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**Correspondent:** 'A correspondent is a person employed by a news agency, periodical, or the like, to gather, report or contribute news, articles, etc. regularly from a distant place' [RHD]. Broadcasting agencies like BBC and CNN also appoint correspondents. From the definition, it is clear that a correspondent is also a reporter who reports from a distant place, usually a foreign country. As we have specialist reporters, so also we have specialist correspondents.

**Investigative Journalist:** One of the important areas of journalism is investigative journalism. Here a journalist engages himself/herself in unearthing such information as smacks of malpractices and corruption in the government machinery or elsewhere. Obviously, to unearth the information, the journalist acts very cautiously and glean information very secretly bit by bit to build up the whole story. The disclosure of the information many a time has got a far-reaching effect. The downfall of President Nixon was the outcome of investigative journalism. (For more information please also refer to Unit No. 18 of this course).

### Police

Crime detection is considered as one of the most important activities of police. In bigger police establishments, there are specialised police personnel to investigate crimes who are often called detectives.

For crime detection, the police have to gather information from a number of sources using various means. In one of the accomplices is nabbed, and then the police tries to extract information about others from him/her employing various methods including interrogation. Apart from criminals, they interrogate many a people in search of a clue. In addition, blood stains, pieces of cloth, strands of hair, cigarette ends, footprints, finger prints, etc. act as valuable sources of information. Those who analyse the aforesaid items are called **forensic scientists**.

The various documents such as crime register maintained by the police abounds in vast amount of vital information on crimes etc. These registers are still found to be useful for ferreting out valuable information about our freedom fighters.



## Detectives and Spies

As has been pointed out earlier, a detective is usually a member of the police force. Sometimes, they may belong to private detective agencies as well. Their job, however, remains more or less the same. A spy on the other hand is 'a person employed by a government to obtain secret information or intelligence about another country' [RHD]. Spies employ various means and methods including various gadgets such as eavesdropping devices [a device used for secretly listening to conversation] to obtain required information.

## Compilers

Bibliographers, lexicographers, encyclopaedists and reviewers stand prominently among the set of compilers of information. Compilers are also gatherers of information. Take, for example, a **bibliographer** – he/she gathers the bibliographical details of documents of his/her interest from numerous sources. Once the details are collected, he/she prepares a standard entry for each of the items. The entries then are organised in a helpful sequence which may be alphabetically author-wise, subject-wise, or year-wise.

A **lexicographer** first of all gathers words, phrases, idioms, proverbs, and so on of a language from written as well as spoken sources and wherever available he/she records the meaning and other details of each and every item. In many cases, he/she is to consult experts to fix the meaning of a particular word or phrase. In some cases he/she is to use his/her own judgment to decide the meaning of a word. Apart from this he/she is to do many other jobs to give final shape to a dictionary such as the derivation and definition of a word. Thus, a lexicographer becomes an excellent source of information on dictionary compilation and master of words.

The job of an **encyclopaedist** is far more laborious and time consuming than that of a lexicographer since an encyclopaedia includes thousands of articles of lengths varying from a few lines to scores of pages. For writing each article, the encyclopaedist gathers information from numerous sources, goes through each and every item thoroughly, and then writes down the article for the encyclopaedia covering each and every aspect. Till the middle of twentieth century, in some cases a single person brought out a multi-volume encyclopaedia spending his/her whole life. For example, Nagendra Nath Basu brought out his/her magnum opus called *Vishwa Kosh* in Bengali as well as in Hindi, both in twenty volumes! Nowadays multi-volume encyclopaedias are usually brought out by renowned publishers where hundreds of authors contribute articles. Encyclopaedists by virtue of their knowledge gained during their work turn into a mine of information.

In this context by the word **reviewer** we mean a professional who author state-of-the-art reviews, critical reviews, and so on. These reviews are totally different from book reviews and depict the overall development of a narrow subject during a particular period, say, one or two years. For this purpose he/she undertakes a thorough search of relevant literature and compiles a comprehensive bibliography. Thereafter, he/she procures the full-text and in some cases abstracts of the documents. Having gone through the documents and getting a clear-cut understanding of the topic he/she consolidates and repackages the information to produce a review. This job updates his/her knowledge and makes him/her an up-to-date source of information on the field.

For bringing out reference sources like yearbooks, directories, books of general knowledge, biographies, gazetteers, etc. the information is gathered by the compilers from diverse sources using various methods. For the compilation of some reference sources like *Directory of Scientific Research Institutions in India*, and *Who's*



Who the information is gathered by mailing questionnaires. For other sources, information is usually gathered from primary and secondary sources.

During census, taken once in ten years in India, you have noticed that a person visits your house and fills up a questionnaire asking the head or any other responsible person of the family a number of questions about the family members, their ages, qualifications, occupations, and so on. These people are called **enumerators**. The information gathered by these people is then processed using powerful computers to generate census reports from various angles.

### Referees

Referees are those person who are considered as experts/peers in a particular field of specialisation. In case of scholarly journals the articles are peer reviewed before publication. Such experts are also a good source of information, though at times it is difficult to keep track of them.

### Self Check Exercise

- 6) Enumerate the categories of compilers, and name the types of books they compile.

- Note:** i) Write your answer in the space given below.  
ii) Check your answer with the answers given at the end of the Unit.

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### 14.5.3 Information Processors

Under this category we shall discuss editors and their varieties, and also the software specialists who write programs for data processing.

When books, articles, reports, etc. are received for publication, in many cases plenty of inconsistencies, inaccuracies, redundancies, incompleteness, etc. are observed. To give final shape to the writing, editorial process becomes essential.

The **editor** while going through the writing, corrects spelling mistakes, capitalisation errors, wrong use of articles, incorrect use of words and punctuation marks, errors in syntax and paraphrasing; removes superfluous sentences, verbose, repetitions and inconsistencies; and fills up omissions. In many cases, the writing is sent back to the author with the corrections and remarks to elicit the author's consent. At this stage the author generally conveys his/her consent with minor alterations and additions. The writing thus attains its final shape and is sent for composition.

In big publishing houses, there are different types of editors such as technical editors, style editors, language editors, and the general editors. A **technical editor** is one who edits technical information. Many publishing houses have got their own style of printing. For example, you will find in *Reader's Digest* that the first letter of an article is always printed with a big font. The numbers occurring in a sentence are spelt out



if it is from one to ten, and written with figures if they are beyond ten. Just see the sentence "...when cancer patients who lacked family support wrote about their illness for 20 minutes a day, they reported less stress for up to six months" [*Reader's Digest*, Nov 2004, p.161]. You may note that in the sentence twenty has been written as 20, and the other number as six. These are the styles of *Reader's Digest*. The **style editor** has to ensure that the publication conforms to the style of the house. **Language editors** are responsible to ensure correctness of the writing from linguistic point of view. A **general editor** looks after almost every aspect of editing.

A **programmer** is a computer professional who writes programs for computers. The data inputted in a computer is processed by the computer following the program that has been loaded into the computer for the purpose. Suppose, a library intends to retrieve books by the title, author(s), collaborator(s), subject, series, place of publication and publisher from the computerised catalogue. Here, the programmer will have to write programs in such a way whereby the computer will be able to process the information to provide the required answer.

The expertise, which various types of editors and programmers possess, makes them important sources of information in the areas of their specialisation.

#### 14.5.4 Information Recorders

The author and the reporter in most cases are found to be the first recorder of information. Inscribers, engravers, calligraphers, printers, data entry operators, etc. are other professionals that belong to this category.

Recording of information through writing has been going on for thousands of years. The early men recorded information not with a set of letters as we do today, but with symbols and pictures. The famous cave pictures at Altamira in Spain and Lascaux in France daubed at least 20,000 years ago seem to convey some definite message such as "Send us more animals like these" [Odams, p.41]. The oldest known writing found on clay tablets in Mesopotamia dates to 3,000 BC or earlier. They were the writings of Sumerians [Odams, p. 44]. Large number of seals found in Indus Valley also contain writings that date back to 2,000 BC or earlier.

In those days information was recorded on clay tablets or similar materials as well as on hard surfaces. Usually **inscribers** or **engravers** used to do the job. As time progressed newer and newer writing material became available and newer species of information recorders like **scribes** and **calligraphers** appeared on the scene. It is said that Sri Ganesh acted as the scribe of Veda Vyas for writing the great epic *Mahabharata*. Even before the birth of Christ, scribes started flourishing in many parts of the world. It is through them multiple copies of Greek and other ancient classics were available, some of which weathered the test of time to survive till date. Thousands and thousands of manuscripts which we see in various libraries of the world are the copies of the manuscripts made by the scribes. Most scribes lost their jobs because of the advent of printing. However, even today you can find scribes in many courts where they make copies of legal documents. Calligraphers with their beautiful handwriting have recorded through ages valuable pieces of information. Even today in many institutions such as universities calligraphers write the names of students on the graduation and other certificates.

After the advent of typewriters in late 1860s, a new species of recorders emerged called **typists**. Even today typists exist and we are all familiar with them. Many authors even today type out their manuscripts instead of writing. Of course, many authors use personal computers now in place of typewriters.



For recording speeches by VIPs, and dictations by officials appeared another species of recorders called **stenographers**. They record speeches and dictations in short hand and subsequently type out the same on paper. In offices stenographers exist even to this day.

Once the manuscript is received for printing, either in handwritten or typed form, it is given to the **compositor**. He/She may compose the matter either using types or any other modern facility such as desktop publishing. Following the composition of the matter, the printer takes up the job and prints a copy for proofreading. The **proofreader** marks all the mistakes committed at the composition stage. Sometimes, the author himself /herself sees the proof and marks the mistakes. At the next stage, corrections are carried out. Sometimes this process is repeated to make the matter completely error-free. The next stage is printing. As per the print order copies are printed, the number varying from a few hundreds to a few lakhs.

With the advent of computers, a new species of recorders called **data entry operators** have come into being. They input data in the mainframe, personal and other computers. Now information is also being recorded in compact discs like CD-ROM and WORM.

In this category of professionals, **printers** at times prove to be good sources of information. By virtue of their job they come in contact with many authors whereby they get acquainted with various aspects of their personality, publications, lifestyles, and so on. Thus, for biographers, printers become good sources of information.

You should not forget that **videographers, photographers, painters, sculptors**, and the like are also information recorders.

#### 14.5.5 Information Disseminators

You can see a great variety of professionals in this category, and most of them are important sources of information. The professionals belonging to this category among others are: library professionals, documentalists, information officers, extension workers, publishers, representatives of firms, receptionists, consultants, marketing officers, broadcasting professionals, press professionals, advertisers, teachers, doctors, lawyers, and hawkers. In addition, all persons engaged in telecommunication activities are also indirectly related to information dissemination.

##### Library Professionals

We have already discussed different categories of library professionals earlier in this Unit. Among the library professionals, reference librarians; compilers of accessions lists, documentation lists, etc. are the disseminators of information.

##### Documentalist

A documentalist involves himself/herself in a number of activities like acquisition, recording, processing of documents and dissemination of information by way of supplying photocopies, computerised outputs, translations, bibliographies, and providing current awareness and selective dissemination of information services. At times, they also provide reference service.

##### Information Officers, etc.

In certain institutions, documentalists are designated as information officers, information scientists, and so on and they perform the same jobs as discussed under documentalists. However, in most cases information officers are encountered in information centres/bureaus, enquiry offices, etc. of government ministries and



departments. Many of our state governments like Maharashtra and Andhra Pradesh have their respective information centres in Delhi. Sometimes these units are called Public Relations Office or Reception, and the officer shouldering the responsibility of the office is called Public Relations Officer (PRO) or Receptionist. In various districts of our country, we have district information centres. Whatever may be the designation, the basic fact is that they are to answer queries posed by the public or any other person. Let us take a few examples.

A person sitting at the railway enquiry counter provides information as to the arrival and departure of various trains, fare between stations, availability of seats/berths on a particular day at a particular train, and so on. In big railway stations, the information about the arrival and departure of trains is continuously announced through public address system.

The information officer of a state information centre provides information about business opportunities, educational facilities, important personages, tourism attractions, etc. of a state. In many cases they also supply a booklet usually containing a map of the state and description of important places, industry, sightseeing places and so on.

An elegantly dressed smart young lady sitting at the Reception Counter of a renowned hotel provides information to potential customers as to the availability of room/s and various other services provided by the hotel and the respective charges thereof through phone, e-mail, fax, and so on.

The PRO of Passport Offices is there to enlighten you about the various formalities to be fulfilled for obtaining a new passport, renewing an old passport, and so on.

A State District Information Officer may provide you a booklet giving a good deal of information about the state district. He/She may also tell you about the facilities the state district authorities can provide for the starting of an industry, a business, and so on.

Only a glimpse is being provided here about the plethora of information supplied by various information officers and their subordinates. The importance of these personnel as sources of information cannot be overemphasised. You can well imagine the number and variety of persons engaged in the job and the type of information they are disseminating.

### **Extension Workers**

We have not yet been able to eradicate illiteracy completely from our country. Still a huge percentage of people cannot read or write. The number of such people is more in rural areas compared to urban areas. Hence, information cannot be imparted to these illiterate mass about healthy living, better methods of farming, low-cost housing, benefits and multiple methods of family planning, and so on through printed material. They can be taught all these to a certain extent through radio and television broadcasting. Unfortunately, many in our country, especially those living in the rural areas, cannot afford a radio set or a TV. As a result, the only option left to us is to implant extension workers at the rural areas. Using lecture-and-demonstration method, they have been educating our rural folk for decades now. Carrying the message of high-yielding varieties of crops and demonstrating to them the method of cultivation has turned our food-deficit country of 1950s to a slightly food-surplus country of 1970s. This shows the effectiveness of extension workers in the dissemination of information. To villagers and other illiterate people they are proving to be a big source of information.



## Marketing Professionals

Industrial concerns in each country turn out various products and services with profit motive. Achieving the objectives entails buying of the products and availing of the services by customers. Customers will not normally buy a product or go for a service that is not known to him/her. Hence, the dissemination of information about a service or a product is a *sine qua non* for sales promotion. This activity involves a variety of personnel like **marketing executives, trade representatives, advertisers, hawkers**, and so on. A marketing executive decides the strategy of marketing keeping in view the prospective buyers, competitors and other factors. He/She moves on from place to place studying the consumer psychology, marketing trend and demand for his/her products and services, identifies the prospective buyers, and posts accordingly trade representatives at various places.

The dissemination of information about medical and engineering products is carried out very well by representatives. They carry the sample of the product and the relevant literature and distribute them to doctors and engineers as the case may be. This process keeps the doctors and engineers informed about the latest products that have entered the market. Once the product meets the expectations of the customers its sale picks up.

The big industrial houses adopt a multi-pronged strategy to disseminate information about their products and services. Apart from trade representatives, they advertise their products through mass media such as a newspaper, radio and television. The dissemination of information through mass media is quick and effective. For attracting customers, information about the product or service is to be presented properly. An advertising agency knows how best the information about a product can be presented in a newspaper, radio or TV. Hence, the help of advertising agencies is often sought to prepare advertisements for various products or services for placing them in desired media. The advertisements that you see in TV or other media are in most cases the production of advertising agencies. These agencies are also taking a big part in the dissemination of information.

You might have noticed persons in buses, trains, weekly markets, and other busy places carrying some products and loudly announcing their qualities and telling that the company is offering them at a cheaper price for sales promotion. These people are called hawkers and are usually employed by smaller forms for bringing their products to the notice of common people.

Recently call centres have emerged as a big disseminator of product and service information. Employees of the call centres contact the prospective customers through telephone and give them details about the products and services. It is like door-to-door dissemination of information, personalised, and hence, the effect in many cases is highly rewarding. Many foreign concerns, are taking the help of call centres in India to advertise their products and services to cut cost of advertising radically.

By now, you must have realised that marketing executives, trade representatives, even hawkers are good sources of information for particular products.

## Publishers

A publisher is usually an organisation that prints books, magazines, newspapers, etc. and make them available to the public at a cost. A regular publisher sends the book for review in newspapers, journals, etc. for review; advertises the book; sends representatives to libraries, displays the books in book fairs, and so on. A publisher has the knowledge of the book market, and can reliably estimate how many copies



of a book can be sold. A publisher also pays the author a small percentage of money called royalty for the books sold out.

Sometimes an author, especially a novice, may not find a publisher to publish his/her book. In such a situation, some authors venture to take the responsibility of publishing and selling of the books on their own. These authors are called **author-publishers**.

In some cases, the author himself/herself bears the cost of printing, and then gives the printed books to a firm, called a **distributor**, since an author is usually ill-equipped to undertake selling. The distributor charges a percentage of the cost of the book for selling.

### Broadcasting Personnel

**Newsreaders** are the best examples of information disseminators. However, from the gathering of the news to its broadcast, apart from newsreaders, there are reporters, **cameramen**, editors, and others who give final shape to the news for broadcasting. Many of these people are also good sources of information.

### Consultants

Consultants generally provide information on technical enquiries in exchange of fees.

### Teachers

Teachers for ages have been the greatest disseminators of information, knowledge and skill. You know, Dronacharya used to impart information to Kauravas and Pandavas on war strategies, fighting, and so on. Aristotle disseminated information about his knowledge, ideas and findings to his numerous disciples. Even today they are possibly the best disseminators as well as sources of information in the subject(s) which they teach.

### Others

It is not possible to enlist all disseminators of information within the brief compass of this Unit. However, it is necessary to mention **doctors** and **lawyers** who also disseminate information. A private doctor and a lawyer charge fees for the service they render.

For purchase of assets, solve disputes, getting a society registered, and for various other purposes, we are to take legal help. Here, the lawyers are the persons to provide us the necessary information. Like doctors, the lawyers also charge fees.

### Self Check Exercise

7) Describe the activities of an extension worker.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 14.5.6 Information Translators

Articles, news items, books, periodicals, patents, theses, etc. are appearing in numerous languages in the world such as English, Russian, German, French, Spanish, Chinese, Japanese, Hindi and Bengali. It is not possible for a person to learn all the languages. Hence, the need for translation or interpretation arises quite often. An anglophone scientist working on black hole requires English translation of the articles appearing in languages like Chinese or Japanese, as the scientist is a stranger to these languages. Similarly a businessman visiting a foreign country to search for customers or business partners need interpreters to convey his ideas to the other party. We need interpreters in international conferences, international trade fairs, sight-seeing places as people speaking different languages gather in these places and they feel pleased as well as comfortable when they hear the lecture or description of an object in their own languages.

Information translators are generally known as translators and interpreters. A **translator** is a person who expresses the sense carried by a word or a sentence of the source language in the target language. Suppose, somebody is translating the English sentence 'I eat rice' into Malaysian. The translation in Malaysian language will be 'Saya makan nasi'. Here the English language is the source language and Malaysian the target language. In translation, the words or sentences are presented in written form, and in interpretation, in oral form. Hence, an **interpreter** is a person who translates orally.

### 14.5.7 Information Condensers

Many a time information needs to be condensed as per the requirement of the user. Suppose, a minister has spoken about the information policy of a country for about an hour. A broadcasting agency is to report the speech of the minister in the news. Obviously, in a 15-minute news, it is not possible to accommodate the one-hour-long speech of the minister. Hence, the editor has to put only the gist of the lecture in the news which can be read, say, in a minute or less time. Similarly, a researcher may like to have the gist of an article published in a foreign language to ensure whether or not the article will be of any use to him/her. For these jobs we need persons who can condense the information.

Information condensers are generally known as abstractors, summarisers, and so on. An **abstractor** is a person who prepares the gist of the intellectual content of an article, a speech, a book, and so on. Abstracts are of various types such as indicative abstract, informative abstract, and extended abstract. An indicative abstract contains less than a hundred words, generally 50 to 60 words. An informative abstract can contain up to 250 words, and an extended abstract goes up to 600 words. A **summariser** is the one who prepares the summary of a piece of writing. A summary is usually longer than an abstract.

### 14.5.8 Information Retrievers

In this category we may include those personnel who retrieve information on demand by searching reference books, databases, Internet, and so on. We call these people reference librarians, database searchers, Internet searchers, and so on.

There is another category of personnel who devise ways and means to retrieve documents in a library, and information from an abstracting/indexing periodical, a database, Internet, and so on with ease. In this category, we may place cataloguers, classifiers, indexers, thesaurus designers, and so on. Except database searchers and



Internet searchers, we have already discussed other categories of information retrievers in this Unit. Hence, here we are going to discuss only **database searchers** and **Internet searchers**.

With the advent of computers, numerous bibliographic databases have come into being. Each database contains huge amount of information. For example, *Chemical Abstracts* (CA) database includes over 17 million citations to the worldwide literature of chemistry from 1967 onward [Internet]. Manual searching of CA for this period will call for many days of painstaking search. On the other hand, searching of the computerised database of CA will be completed in a very short time, say, within one or two hours depending upon the query. The search strategy varies from database to database. For example, there is a tutorial for searching CA. Without mastering the search strategy, searching a database is most unlikely to yield best results. Hence, a database searcher should be well aware of the contents of the database, the subject as well as its search strategy.

There are some organisations like American Chemical Society and INSPEC that are database producers, and there are others who are database vendors. DIALOG is one such database vendor that provides access to more than 900 databases containing over 330 million articles, abstracts, and citations, devoted to a variety of subjects including science and technology. For searching these databases, fees are to be paid that vary from database to database. Each subscriber to DIALOG databases is given a password using which the database searcher can search any of these databases to extract the needed information. This itself reveals the importance of a database searcher. Now DIALOG databases can be searched through dialog web.

Internet is an unbelievably rich source of information on any subject under the sun. The information available in Internet is usually more up-to-date compared to their printed counterparts. Moreover, searching information in Internet takes much less time compared to manual searching. Hence, no search today is complete without the Internet search. Information professionals who search Internet using a search engine like Google are called Internet searchers. They are also rich source of information.

#### 14.5.9 Information Quantifiers

Every moment information is ceaselessly generating in the world and cumulating day by day. With the passage of time some information is becoming obsolete. It is necessary for various purposes to know the rate of growth, decay, and many other properties of information. To study all these phenomena a new species of information professional has emerged called informetricians. They attempt to measure growth, propagation, use and decay of information; establish laws governing these factors; study the efficiency of information systems, services and products; and explore the intra- and inter-relationship among disciplines.

#### 14.5.10 Information Preservers

Men since time immemorial have been trying to preserve information by various means. Even today men are discovering and inventing newer and newer methods and media of preservation. Information is being preserved in two different ways: (i) by the preservation of documents applying chemicals, laminating the papers, and other methods, and (ii) by the preservation of the contents by way of photocopying, reprinting, taking micro-images of the contents on films or digitising the content. All these professionals including **reprographers** are information preservers. The **archivists**, **micropublishers**, **electronic publishers**, etc. are preservers of information on the one hand and sources of information on the other.



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## 14.6 SUMMARY

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Having defined the library professionals, we have enumerated them as library administrator, classifier, cataloguer, classificationist, indexer, reference librarian, library and information science teacher, thesaurus designer, bibliographer, librametrician, bibliometrician, and content developer; described each of them in short, and in many cases indicated how they act as sources of information. Next, we have explained the term information professionals, and categorised them as information generators, gatherers, processors, recorders, disseminators, translators, condensers, retrievers, and preservers. We have also outlined the areas of activity of each of them, from which one can decide for what type of information they can be consulted. The Unit tried to project the entire spectrum of library and information professionals.

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## 14.7 ANSWERS TO SELF CHECK EXERCISES

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- 1) A library professional is one who has been trained in library and information science. He/She is also paid for the job that he/she does. In a library all are paid for the jobs they do. However, all are not trained in library and information science. For example, a library clerk is not trained in library and information science. Hence, all persons working in a library are not library professionals.
- 2) Library professionals may be categorised as the library administrator (designated variously as chief librarian, librarian, library manager, deputy librarian, assistant librarian, etc); classifier; cataloguer; classificationist; indexer; reference librarian; library science teacher; thesaurus designer; bibliographer; librametrician; bibliometrician; and content developer.
- 3) A classificationist possesses deep knowledge of the principles of classification as well as epistemology. He/She studies the origin, nature, growth, proliferation and limits of human knowledge; does research as to how a new subject comes into being, how it proliferates into branches and sub-branches, and how a particular subject decays. He/She also studies the relationship of various subjects and structure of knowledge. Hence, one can approach a classificationist for any type of information discussed above.
- 4) Information generators are: researchers, inventors, innovators, thinkers, authors, planners, policy makers, decision makers, judges and many others.
- 5) Before sending the information to the press, a reporter has got to be doubly sure as to the authenticity of the information. Suppose, due to police firing some persons have been injured. After reaching the spot, the reporter will try to ascertain the number of persons injured and the cause of the firing. Quizzing the persons present at the venue, he/she is likely to get different figures and views from different persons as to the number of persons injured and the cause of firing. To establish the actual number of persons injured and ascertain the cause, he/she will interact with the nearby doctors and hospital(s) where the persons have received first aid or have been admitted for treatment; visit the concerned police station; and interview the injured people themselves, the people present at the scene, local political leaders, and other reliable sources to build up his/her entire report.
- 6) Bibliographers, lexicographers, encyclopaedists, reviewers, etc. are compilers. They compile respectively bibliographies, dictionaries, encyclopaedias, and reviews. Compilers also bring out such reference books as bibliography of bibliographies, books on general knowledge, yearbooks, directories, collective



biographies, gazetteers, and books of records such as *The Guinness Book of Records*.

- 7) An extension worker generally disseminates information to rural folk, most of whom are illiterates or neo-literates, about better method of farming, healthy living, low-cost housing, benefits and methods of family planning, etc. by way of talks, lectures, and demonstrations.

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## 14.8 KEYWORDS

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|                                              |                                                                                                                                                                                                                    |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Archivist</b>                             | : A custodian of documents or records relating to the activities, constitutions, claims, rights, treaties, of a historical figure, family, community, corporation, or a nation.                                    |
| <b>Call Centre</b>                           | : An office in which large number of telephone calls are handled, especially one providing customer services through telephones.                                                                                   |
| <b>Calligrapher</b>                          | : A person who excels in writing beautifully and decoratively.                                                                                                                                                     |
| <b>CD-ROM</b>                                | : An abbreviated form of <b>Compact Disc – Read Only Memory</b> . It is an optical disc of 6.25cm radius and has the capacity to hold information equivalent to 1,000 double-sided-double-density (DSDD) floppies. |
| <b>Desktop Publishing (DTP)</b>              | : The production of high quality printed matter by means of printer linked to a desktop computer [COD].                                                                                                            |
| <b>Electronic Publisher:</b>                 | A publisher that brings out publications in machine-readable form. Synonym: e-publisher.                                                                                                                           |
| <b>Engraver</b>                              | : A person who cuts or curves a text or design on a hard surface.                                                                                                                                                  |
| <b>Inscriber</b>                             | : A person who writes or curves words on a surface especially as a formal or permanent record.                                                                                                                     |
| <b>Lexicographer</b>                         | : A writer or compiler of a dictionary. [RHD]                                                                                                                                                                      |
| <b>Library and Information Professionals</b> | : Professionals engaged in library and information science activities as a paid profession.                                                                                                                        |
| <b>Linotype</b>                              | : A typesetting machine, generally used by press and big industrial houses. It casts solid lines of type from brass dies or matrices, which are selected automatically by the actuation of the keyword.            |
| <b>Lithography</b>                           | : The process of printing from a flat metal (formerly stone) surface treated so as to repel the ink except where it is required for printing. [COD]                                                                |
| <b>Micropublisher</b>                        | : A publisher that brings out publications in microforms.                                                                                                                                                          |
| <b>Monotype</b>                              | : A typesetting machine generally used by the press and big publishing houses. It casts individual types on a paper tape containing holes in a coded pattern.                                                      |
| <b>Profession</b>                            | : A paid occupation, especially one involving training and formal qualification [COD].                                                                                                                             |

- Professional** : A person engaged in an activity as a paid occupation rather than as an amateur. [COD]
- Reprographer** : A person who reproduces or duplicates printed documents, written material, drawings, designs, etc. involving any process that makes use of light rays or photographic means including offset printing, photography, office duplicating, etc. [RHD]
- Scribe** : A person who serves as a penman or copyist, especially one who in former times made copies of manuscripts. [RHD]
- WORM** : An abbreviated form of **Write Once and Read Many** times. This is also an optical disc. The user can input data onto the disc once, and thereafter he can read the data using a personal computer.

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## 14.9 REFERENCES AND FURTHER READING

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## UNIT 15 INFORMATION INTERMEDIARIES

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### Structure

- 15.0 Objectives
- 15.1 Introduction
- 15.2 Information Intermediaries – Characteristics and Functions
- 15.3 Information Intermediaries in the Post-Industrial Society
- 15.4 Types of Information Intermediaries
  - 15.4.1 Information Brokers
  - 15.4.2 Information Consultants
  - 15.4.3 Online Vendors
  - 15.4.4 Technological Gatekeepers
  - 15.4.5 Invisible Colleges
  - 15.4.6 Information Filters
  - 15.4.7 Extension Workers, Paramedical Professionals, Block Development Officers, etc.
- 15.5 ICT and Information Intermediaries
  - 15.5.1 Role of Internet in Intermediary Functions
  - 15.5.2 Filtering Software
  - 15.5.3 Expert Systems
  - 15.5.4 Electronic Brokerage
- 15.6 Information Intermediaries in India
- 15.7 Summary
- 15.8 Answers to Self Check Exercises
- 15.9 Keywords
- 15.10 References and Further Reading

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### 15.0 OBJECTIVES

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After reading this Unit, you will be able to:

- know the characteristics and functions of information intermediaries;
- identify different types of information intermediaries in various subject fields;
- get a clear insight into the various types of information intermediaries; and
- able to visualise the new form of information intermediaries which is gaining importance due to ICT developments.

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### 15.1 INTRODUCTION

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Many of the modern societies are moving towards a knowledge economy, wherein information has become a very powerful ingredient for bringing about economic and social progress and development. In practically every sphere of human

activity today, information and knowledge are indispensable vital resources. Information accessibility and availability have, however, become much more complicated and complex as compared to situations existing for similar activities a few decades ago. In fact, in the past, information searching and acquiring required information were far simpler for users. They could easily navigate to obtain relevant reference with the background knowledge of their respective fields and easy procedures for searching. But today, with the fast growing volume and variety of information in multiple forms and subjects/disciplines, a need for a different group of specialists arises who could supply users with the relevant information, providing a high quality service.

Added to the complexities of information access, there are users involved in a variety of highly specialised activities. All the needs of the different categories of information users have propped up the emergence of a new group of experts and institutions who/which could serve as a vital link between users and their specific information needs. These groups of experts/institutions are termed as "Information Intermediaries". Persons who are operating as intermediaries are not only subject experts in their respective fields but also are equally skilled and knowledgeable in information searching and making the desired information available to users with the speed that is demanded/expected. In other words, intermediaries are experts who serve as an important link between users and information, who collect relevant information for users, process and disseminate them. In essence, they act as an interface between producers and users of information.

Information Intermediaries are basically of two types. The first type constitutes Information brokers, Information consultants, Online vendors, etc. who charge a fee for their services, as a business venture, being motivated to earn a profit. Reference librarians and information officers and a few other groups and agencies who offer some of the current functions of the information intermediaries do not charge a fee, as they are motivated by a spirit of service.

In recent decades, new types of information intermediaries have also cropped up such as invisible colleges, technological gatekeepers, and information filters. There are Experts Systems and Internet Services that are also playing the role of information intermediaries.

Apart from these types of information intermediaries, groups such as extension workers, paramedical professionals, block development officers have also been offering a highly specialised information services in rural and semi-urban settings as agents of information transfer, particularly in the Indian context.

All these types of information intermediaries, their compositions, functions and services are discussed in some detail in the different sections of this Unit.

### **Information Intermediaries – A Working Definition**

For arriving at a working definition of information intermediaries, it would be worthwhile to examine the necessity for the emergence of the different types of intermediaries. We have already mentioned the circumstances, that necessitated the creation of specialised types of information services, which are need-based, and user centered. For example, persons in R & D, industry and business, institutes of higher education, management of institutions and organisations, government ministries and departments, and even common persons for their day-to-day activities, require information for their specific needs. In fact, there is no activity wherein information is not a vital component. More particularly, in the present context of demand-based



information markets, there is a need for a group of experts who serve as middlemen to bring together producers and consumers of information, analogous to a trading situation of consumer goods which brings together the producer and the consumer.

As information is also considered a tradable commodity, consumer satisfaction is essential, depending upon the usefulness of the supplied information. In such a context, the role of the middleman who serves as a link between the producer and consumer is obviously very vital. This group of middlemen, as a group or an organisation/institution or computer-based information agents are primarily performing a linking function between the user and the information products. They can be seen as parasites, drawing skills from both the producers as well as the consumer groups, as against proverbial parasites that draw only from their hosts. These functions, traditionally, have been performed by reference librarians or information and knowledge service providers in libraries and information centres for a long time. But the fast emerging knowledge society with the increasing demand for need-based information services by a great number of user categories and the burgeoning information sources, have accentuated the need for a new group of information experts.

The functions of this kind of a distinct group of information professionals are not to create or generate primary information *per se* but to establish a link between the producer and consumer of information. Their activities include collection and selection of information, consolidation and repackaging, condensation and such others all totally oriented to the needs of users. These groups are, therefore, named as Information Intermediaries who perform at an intermediate level, connecting the user with their information needs.

Though the word information intermediaries might have emerged in the context of profit making services, the term is applied to all types of information intermediaries, i.e., to an expert or a group of experts, or organised institutions, or computer-based agents, offering a special service which links the producers and consumers and facilitate the best use of supplied information. The developments of these types of information services are becoming highly ICT based and have permitted growth of other services in various dimensions.

Many expert systems have been designed and developed which offer pinpointed information services focusing on customer needs. The Internet is also now performing many of these specialised jobs, offered earlier by traditional intermediaries.

### Self Check Exercise

- 1) What do you understand by the term 'Information Intermediaries'?

**Note:** i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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## 15.2 INFORMATION INTERMEDIARIES – CHARACTERISTICS AND FUNCTIONS

### Characteristics of Information Intermediaries

The value of information intermediaries lies in the extent of their ability to:

- satisfy the requirement of the producers and consumers of knowledge;
- transfer the products and services between the producers and consumers/users of information.

In bringing together the producers and users of information, the intermediaries should have:

- i) knowledge of the sources of information and how these sources can be used to extract information according to requirements;
- ii) knowledge of the technical aspects of the information transfer;
- iii) knowledge of the subject in which they are to operate;
- iv) awareness of the user's characteristics and also the environment under which the users operate in the context of present ICT development; and
- v) knowledge of the Internet sources and services.

From the point of view of effective transfer of information certain specialised skills are also required. These are:

- i) effective communication skills: written or oral;
- ii) mental capability to analyse and interpret user's needs exactly;
- iii) skills for information retrieval such as search tactics and techniques;
- iv) technical skills such as data entry operations, handling of software packages, knowledge about the search engines and their features relating to specific subject of activity and searching on the net; and
- v) knowledge of knowledge-industry.

In terms of personality traits, the intermediaries should be:

- i) intuitive;
- ii) inquisitive;
- iii) extrovert;
- iv) interested in others;
- v) emphatic;
- vi) enquiring;
- vii) self-confident;
- viii) flexible; and
- ix) technically sound.



## Functions of Information Intermediaries

The primary function of intermediaries is to provide quick and adequate information to the users. The principal functions, which they perform, are:

- i) searching data and information;
- ii) analysing data and information and consolidating them, if required, according to necessity; and
- iii) disseminating information in required form.

In performing these functions, the intermediaries have to consult a number of information sources—primary, secondary and tertiary. Knowledge of the contents of these information sources, their organisation and presentation, the techniques of search for and retrieval of information from them, and many other skills are essential to make the best use of these sources to offer user oriented, need-based services.

### i) Searching Data and Information

The major activities concerning this function are: identification of users and their information needs; identification of the data sources which may satisfy the information need, developing search strategy and accessing the databases, either manually (library shelves, catalogue cards, etc.) or electronically (automated system or net). They are also required to evaluate the search results. Sometimes, they also perform the function of suggesting users to the other sources of data and information. They are also known by various names such as, Information Counsellor, Reference Librarian, Reference Specialist, Information Searcher, Technical Information Specialist, Patent Searcher, Knowledge Executive, Knowledge Officer, Knowledge Manager, etc.

### ii) Analysing Data and Information

This function requires research and analysis of data and information in various sources available in libraries, computer files, databases and web portals. The analysis may result in the activities like abstracting, simple summarisation of previously written materials, consolidating the information from various sources, computer generated output and so on. The group which performs such type of tasks are known by various names like Analysis Specialist, Information Counsellor, Operation Analyst, Research Assistant, Knowledge Resources Analyst, and Subject Specialists like Economic Analyst, Financial Analyst, Management Analyst, Patent Analyst, etc.

### iii) Disseminating Information in Required Forms

The activities concerning this function are delivery of information in a required form and format. These may encompass the activities of consolidation and repackaging, preparation of State-of-the-Art Reports, Reviews, etc. They are known by various names like Information Analyst, Information Research Officer, Reviewer, Documentation Officer, Publication Officer, etc.

The other functions, which the intermediaries may have to perform, are listed below:

Information Intermediary is supposed to:

- a) maintain liaison with information providers;
- b) conduct research into user needs and find out solutions to the problems that arise in this regard;

- c) gather material from various sources and briefs;
- d) provide drafts for news and features from source materials;
- e) provide briefs for public statements;
- f) help to handle inquiries from media, organisations and public at large;
- g) spread the information through a variety of media; and
- h) develop and expand the range of publications for specialised markets, etc.

### Self Check Exercises

- 2) Enumerate the specialised skills required by the Information Intermediaries.
- 3) Discuss briefly the three basic functions of the Information Intermediaries.

**Note:** i) Write your answers in the space given below.  
ii) Check your answers with the answers given at the end of the Unit.

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## 15.3 INFORMATION INTERMEDIARIES IN THE POST-INDUSTRIAL SOCIETY

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A notable and significant factor that characterises the functions of information intermediaries is their changing role with the emergence of the Post-industrialised Society (the Knowledge Society). As pointed out earlier, the indispensability of information needs of users in a variety of situations and the complexity of information resources have compelled information intermediaries to create innovative techniques and methods to produce the most appropriate user oriented products and services.

In the words of Tom Stonier (1983), the important features of Post-Industrial Society are:

- a) service economy rather than a manufacturing one in which the knowledge industry plays a pre-dominant role; and
- b) it is characterised by a labour force which is dominated by people who operate with information contents rather than with machines.



The changing role of the intermediaries can be visualised with the help of the Table 15.1.

**Table 15. 1: Different Type of Workers and their Roles in Post-industrial Society**

| Sl. No. | Functions                                                  | Type of Workers                                                                                                                               |
|---------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Organisation of Information                                | Managers                                                                                                                                      |
| 2.      | Transmission of Information                                | Secretaries, Telephone Operators, Postal Workers, Journalists, Educators, Technical Sales People, Database Vendors, Information Technologists |
| 3.      | Information Storage and Retrieval                          | Filing Clerks, Librarians, Information / Knowledge Workers, Computer Programmers, Database Developers                                         |
| 4.      | Creation of New Information or New Patterns of Information | Scientists, Social Scientists, Artists, Statisticians, Architects, Designers, Economists                                                      |
| 5.      | Application of Information to Solve Particular Problems    | Lawyers, Doctors, Counsellors, Accountants, Policy Makers, Corporate Decision Makers                                                          |
| 6.      | Reception of Information                                   | Students, Common People                                                                                                                       |
| 7.      | Production and Packaging of Information                    | Publishers, Information Analysts, Information Service Providers, System Designers, Computer Programmers                                       |
| 8.      | Manipulation of Information                                | Advertising Personnel, Public Relation Personnel, Media Personnel                                                                             |

While the Post -industrial society will be characterised by information and knowledge handling of all types and levels, not all jobs will necessarily involve the kind of work or require the kind of skills that information intermediaries now have.

The role nearest to the functions of traditional information intermediaries is that of the information professionals as an agent of change, the essential ingredient of a vastly enlarged and upgraded notion of knowledge service. They would break into the problem-solving activities of others at various points, helping them to articulate their problems and search for solutions. There may be other possibilities for the expanded role for intermediaries, such as, education function, introducing end users to new resources and training them in their use.

### **Information Intermediaries and Changing Global Markets**

Globalisation is one of the major changing patterns in Indian economy that makes India a global player in knowledge-based industries and back-office operations. Since the liberalisation of economy and the effects of globalisation could be felt in Indian enterprises through their global market penetration and expansion. Many information and knowledge processing organisations are operating from India to provide solutions to some of the global information producers as well as to some global blue-chip corporations and *Fortune1000* corporations. These corporations are making profits through their innovative products design and marketing strategies that are obtained from dedicated, futuristic research and development (R&D) activities and business intelligence functions. The major information inputs for R&D and business intelligence come from information intermediaries. In developed countries the information intermediaries are very active to provide customised, personalised and filtered information solutions to corporations. In India a number of corporate-sponsored collaborative R&D activities are taking place



in academic institutions and a number of corporate R&D centres are also in operation. These institutions consume the services of information intermediaries to get timely access to nascent information. The market of information intermediaries in India widens proportionately and the entrepreneurship is developed in this business segment to serve the emerging markets.

All the functions of information intermediaries mentioned earlier need not be done by in-house professionals, though their services will be required. This opens up new opportunities for information intermediaries such as, consulting services, online search services, etc.

### **Information Intermediaries in Various Fields**

Information Intermediaries exist and provide information support in various professional or vocational areas of activities. In the field of science and technology, they facilitate information from scholarly publications so that scientists and technologists can grasp the knowledge in close proximity to their areas of research. In the field of social sciences, they provide information on social indicators, social trends, social conflicts and social developments, to the social scientists, social workers, policy makers and other professionals whose areas of activities are linked to the society. In the field of corporate decision-making, information intermediaries provide dynamic information on business trends, market development and socio-economic environment that are linked to business intelligence. Here, information can be generated after scanning of environment, scanning of regulatory frameworks, scanning of corporate literature, like, annual reports, balance-sheets, etc. and analysis of feedbacks of users. In all these fields of activities, information intermediaries play a vital role for various reasons: Firstly, all kinds of information is growing at a tremendous rate and such information whether it is R&D, process/product, numerical or textual, are scattered in various forms and types of sources. Secondly, there is a steady increase in the number of users and their complex information needs. These two coupled with the need for faster delivery of information according to requirements of users, make the role of information intermediaries in these fields more challenging. In many cases, libraries and information centres also perform some of the activities. The role of intermediaries is, however, quite different in the sense that they do not maintain or organise document collections. They use various resources to fulfil their objectives. The information intermediaries are generally experts in their respective subject fields. Their expert observations, in-depth knowledge and interpretative skills help them to perform the functions more efficiently. Though these groups operate on a commercial basis, there are others also, like Technological Gatekeepers and Invisible Colleges, which perform many of the activities on a non-commercial and non-formal basis.

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## **15.4 TYPES OF INFORMATION INTERMEDIARIES**

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The information intermediaries may be of different types. Broadly, some of them are human experts or organisations, whereas some others are automated intelligent agents. The information intermediaries in various disciplines comprise information brokers, information consultants, online vendors, technological gatekeepers, invisible colleges, information filters, etc. In rural and semi-urban areas, extension workers, paramedical professionals, block development officers, social workers play a vital role as information intermediaries.

Information intermediaries are, thus, basically of two types: the profit making and the non-profit making ones. Under profit making category comes all those persons or organisations who provide information for a fee. Information Brokers, Information Consultants, Online Vendors come under this category. Apart from this many R&D organisations appoint information specialists to perform the functions of Information Intermediaries to fulfil the information need of their own staff. Information Officers,



Knowledge Officers, Knowledge Managers, Publication Officers, Documentation Officers, Information Analysts, etc. come under this category. The other category of non-profit making information intermediaries, as has been pointed out earlier, such as reference librarians and information officers who offer some /many of the services offered by modern information intermediaries, do not charge any fee as they are traditional services offered by libraries and information services for a long time. Invisible colleges are also non-profit making information intermediaries.

There are also many informal types of Information Intermediaries such as, Invisible Colleges, Extension Workers, Block Development Officers, Health Workers, Social Workers-working in rural, semi-urban and urban areas. All these constitute important types of information intermediaries who may be either individual human beings or persons working on behalf of the organisations.

The automated intelligent agents as information intermediaries are yet another category in recent times. Some human powered computer programs can be helpful to perform some functions of information intermediaries. All these automated intelligent agents can be categorised as, collaborative information filters, and experts or knowledge-based systems. They produce some productive solutions to intelligently access electronic sources of information, which are growing very rapidly.

#### 15.4.1 Information Brokers

'Information Broker' refers to those individuals or firms, who provide information service for a fee. A great impetus for the growth of information brokers has come from the recognition that knowledge is a business and information is a commodity. Many of the users of today's Information Brokers are special libraries. However, most of the clients of Information Brokers are firms and individuals who do not have their own special library. Information Brokers are basically the information clearing houses acting as a link between the information that is available and those who need it.

Information Brokers generally perform two types of activities relating to information services. Handling client's day-to-day information needs – usually questions requiring less than two hours of search time is one type of activity. The other one is to handle more complex activities requiring attention at greater depth. Apart from these two basic types, other range of services provided by them are: quick telephone surveys, translations, information consulting, current awareness services, literature searching, compilation of bibliographies, abstracting, report writing, retrieval of specific facts or statistics from any non-classified source, provision of photocopies of published material, provision of copies of published material from electronic source, etc.

Services of the Information Brokers are availed by a wide variety of organisations, e.g., corporate organisations, different categories of industries, advertising agencies, publishers, media houses, etc.

Information Brokers should possess certain characteristics to perform their roles effectively and efficiently. Such characteristics according to Alice Johnson (1991) are:

- understanding the power of information
- ability to understand the actual needs of the client, not necessarily those which are stated
- skills in interviewing, listening, communicating
- adaptability to new situations
- ability to organise concepts as well as objects or things
- ability to analyse, interpret, synthesise and repackage information



- ability to train and work with non library-oriented staff
- administrative ability and business expertise
- research experience
- ability to interact with databases and Internet/ Intranet resources
- ability to work independently
- entrepreneurship skills.

### Categories of Information Brokers

Information Brokers are generally categorised into two types:

- 1) Independent information brokers whose main source of income is by selling information services. Many information entrepreneurs, information consultants and freelance librarians can be included in this group.
- 2) Fee-based services attached to an organisation or institution usually in the public sector or non-profit making institutions. Some of the services provided are free of charges, it is only for some services such as online searching, compilation of bibliographies, document delivery, or photocopying which are charged and at times may be at subsidised rates. For example, information services of NISCAIR, New Delhi (National Institute of Science Communication and Information Resources) may fall under this category.

#### 15.4.2 Information Consultants

Consultants are specialists who give expert advice. Basically their work involves reviewing and evaluating technologies on behalf of a client, advising on matters relating to their field of specialisation. They also help in developing new skills or knowledge on behalf of the clients. In the industrial sector the consultants play a vital role by providing information and advice on product development, process development, organisational resources deployment, documentation of organisational knowledge, export, import, etc.

Importance of consultants and consultancy services is felt in many business, social and R&D functions for turnkey solutions or solutions for specific problems. In India, a number of consultancy organisations are in operation for various fields of activities. For example, *PriceWaterhouse Coopers, Tata Consultancy Services, Ernst & Young, Arthur Anderson, KPMG, McKinsey, Anderson Consulting*, etc. who engage a number of professionals from different disciplines, mainly in compliance auditing, accounting, project management, ICT solutions development, organisational effectiveness measurement, organisational capability enhancement, quality management, and so on. There is also a number of information consulting firms in India, which are engaged in core library and information related functions in different organisations and institutions, mainly in government and semi-government sectors. These firms provide solutions for functions like library automation, retrospective conversion of bibliographic records and content digitisation on project basis.

‘Information Consultant’ is a term used for those persons or firms involved in various activities including maintenance of library and information centre; library and information centre design; database design; users-interface design; library website design; content management of library website; records management; hardware and software selection and training; organisational change management; project management; content digitisation, etc. Consultants can also be referred to as for-profit library services like cataloguing and collection development, and editorial services, and other service like indexing, abstracting, etc. Erstwhile INSDOC (now NISCAIR) provided various such services



like library and information centre design, maintenance of library and documentation centre (e.g. CFRI, Dhanbad), hardware and software selection (e.g. Delhi Stock Exchange), records management, etc.

Some of the purposes of Information Consultants are summarised below in order of their importance:

- To provide requested information
- To provide solution to a given problem
- To conduct diagnosis that may redefine problem
- To provide recommendations
- To assist implementation
- To build consensus and commitment
- To facilitate client learning
- To improve organisational effectiveness.

The basic difference between Information Brokers and Information Consultants is that the Broker provides information on demand, while the Consultants tell what to do with information and how to do it. The reasons for using consultants vary but can be summarised under four general headings. They are:

- 1) **Political reasons:** To supply objective independent advice.
- 2) **Economic reasons:** Consultants can be highly cost-effective, saving money by implementing change effectively.
- 3) **Technical reasons:** For professions which are becoming more complex and skilled manpower is often in short supply.
- 4) **Convenience:** Employment legislation makes it difficult to employ staff on a short-term basis.

Like any other profession, information consultants have their own unique set of tools, e.g., databases, document delivery techniques, electronic mail, local area networks, reference books, software and subject specialists, etc. The consultants get their work done with the help of these set of tools, a particular combination and configuration of specialised equipment, technique and style to get their job done. Many times the consultants get their job done by sub-contracting. Advancement in information and communication technologies (ICTs) is directly responsible for the recent and rapid growth of information consultancy profession.

### Self Check Exercise

- 4) Distinguish between Information Brokers and Information Consultants.

**Note:** i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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### 15.4.3 Online Vendors

The areas in which the Information Intermediaries have flourished more in the recent years are in the field of computer-based information retrieval services. Many special libraries and information units make use of external search services to assist in their queries. The major commercial services, sometimes called the hosts and vendors are accessible online through various dedicated telecommunication networks, such as, Tymnet, Telenet, etc. These vendors provide the facilities of accessing various databases processed by them. Some of the well-known vendors are DIALOG and BRS in USA, BLAISE and ESA-IRS in UK. In India also organisations like Informatics are providing such services. There are organisations whose function is to offer online computer facilities and specialised software to their users and thus, function as intermediaries. But the services of online vendors have changed significantly after proliferation of Internet-based online information services. Internet offers low-cost method of accessing bibliographic and full-text databases, which are easy to search, navigate and retrieve. Thus, online vendors now becoming an extinct species, and these firms have changed their mode of delivery of services through Internet, instead of dedicated telecommunication networks.

### 15.4.4 Technological Gatekeepers

Scientists, research workers and management experts seek information through formal channels of communication. In the sphere of research there are other informal channels of information such as, personal contacts, peer group exchanges, which are usually approached for seeking vital information not normally accessible through formal channels. One of these channels is through Technological Gatekeepers.

The Technological Gatekeepers are those who are usually consulted by their colleagues for information and act as a link between the internal users of any organisation, institution, etc. and the external sources of information. This consultation takes place as a first step though other avenues are also available to the enquirer. Allen (1968) named them "Gatekeepers" as they open the gate of information for others. This group makes exhaustive use of information services and has well developed outside contacts. Information immediacy is increasing, i.e., the users need more timely access to information. Moreover, there is a trend of diversification of branches of knowledge, increasing the number of narrow fields of interest. All these have resulted in an exponential growth of information. The function of Technological Gatekeepers is to gather and repackage information and supply them to the researchers of the organisation. The gatekeeper's function is, however, not limited to the inflow of information. They are also concerned with the outflow of information that is generated in the organisation itself in the form of research outputs. The characteristics of Gatekeepers are that they are well informed and have specific and recent information in their fields.

Technological Gatekeepers are different from Invisible Colleges. The invisible colleges are concerned with the flow of information among individuals in different institutions, whereas gatekeepers are concerned with the flow of information within an institution. The role of the gatekeeper is getting enhanced in this era of Internet working and gateways and also with the radical changes in sphere of information. It is not possible for any R&D organisation to acquire all the information required by the researchers working there. Thus, a gatekeeper is appointed who works as a liaison officer between the sources of information and the organisation.

### 15.4.5 Invisible Colleges

Invisible Colleges are yet another form of non-profit making Information Intermediaries. In invisible college, a group of persons informally forming a group for exchange of information and ideas. It is a small body of individuals who dominate and set the tone



and agenda for the societal sector. Such elite groups are universally found in governments, agriculture, manufacturing, commercial and trade enterprises, etc. Invisible college may be an informal group or a formal group, where member communities share their expertise and subject knowledge. They are also found in the various disciplines making up the scholarly community. Invisible colleges are very helpful as information intermediaries as they are well aware of new developments and vistas of research. These groups sometimes communicate with their member community through listserv or any other Internet-based mechanism.

### Self Check Exercise

5) Discuss the possible future of online vendors.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 15.4.6 Information Filters

One of the major problems faced by users is the information overload. In the search of databases or even searching the Internet, a large number of references are retrieved. It becomes difficult to sort out relevant references from the huge number of references retrieved. Naturally this problem requires a filtering process to arrive at optimum number of relevant references. Information filtering, however, is not a new process in information searching and retrieval. Many techniques have been developed to narrow down search, using Boolean logic, IR thesauri, truncations and such others to arrive at relevant references. These functions used to be performed by mediators like reference librarians or information officers in a conventional library or information centres. Naturally those who perform these functions should have the necessary subject expertise as well as skills in information searching. In this way, these intermediaries serve as a link, overcoming the problem of information overload. In this process, potential information sources are also brought to the attention of users, which might be overlooked by users. This filtering process can be performed manually or electronically.

In computer-based systems, filters can be used to block or to restrict unwanted contents of the websites, like references on addictive drugs, violence or racism, from accessing. On the other hand filters can be used to generate objective search results within the users' known preferences. There are softwares, which are developed for facilitating filtering process. These are discussed in detail in the section on 'Filtering Software'.

### 15.4.7 Extension Workers, Paramedical Professionals, Block Development Officers, etc.

In the Indian context, Extension Workers, Health Workers, Social Workers, Block Development Officers—all play an important role in information transfer process in rural, semi-urban and urban areas.

The function of the **Extension Worker** is to collect, assimilate and repackage information according to level and requirement of the users in villages and towns. An



intensive agriculture extension service has been introduced in India to ensure speedy transfer of farm technology to help achieve productivity in agriculture. The Extension Workers are trained in the latest know-how, by research scientists and they transfer know-how to the farmers. The Extension Workers also provide information relating to problems faced by the farmers in various aspects of farming on the basis of which, further research is done. Thus, they provide a two way communication between the farmer and the scientists. This type of information personnel is specially required in countries like India where the percentage of literacy is low.

**Paramedical Professionals** such as midwives, block extension educators, family planning field workers, community health workers, etc. form yet another category of information intermediaries in the rural and semi-urban areas. Their main aim is to provide medical information to the villagers and city-dwellers regarding health, hygiene, family welfare measures, etc.

Similarly, the **Block Development Officers (BDOs)** also have an important role to play as information intermediaries in the particular block they are concerned with. A BDO acts as a liaison between government and the local body, like Panchayat. A number of schemes and programmes of the government on social development are ultimately disbursed to the underprivileged citizens through BDOs who have the responsibility to inform and educate the concerned citizen about the availability of such schemes and programmes. A number of non-government organisations are working across India towards community development, income generation, eradication of poverty, and eradication of illiteracy. The social workers play, as information intermediaries, to inform and educate the mass on various social and economic issues related to them.

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## 15.5 ICT AND INFORMATION INTERMEDIARIES

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The Information Communication Technologies (ICTs) play a vital role in storage and dissemination of information from various sources to different categories of users. Information are scattered over a number of documentary sources and databases throughout the world. On the other hand, Internet is considered as a valuable information source and as an aid to sources of information. The libraries and information centres use many ICT tools and applications for different purposes. Various sources of information, from the primary literature to secondary and tertiary literature are presently available electronically, either through Internet or through offline electronic media, like, CD-ROM. The producers of these electronic sources of information provide advanced features for accessing information through various approaches, so that the retrieval can be at the satisfactory level. Getting most useful information from the online electronic information resources is a complex process, as it requires the sophisticated retrieval capabilities in tune with the individuals' needs and preferences. Many times users get unwanted or irrelevant information from the search services. The exponential growth of literature is another threat to users who want to get some pinpointed information or documents from the vast sources of information. Some subject-specific Information Gateways have been established by the consortia of research and academic institutions in some subject areas to access a chunk of information through a single interface. In recent years, some automated information intermediaries have emerged as a solution to the requirement of customised or personalised information services. This kind of information intermediaries is developed by computer programmers in consultation with subject experts that can be called **Intelligent Agents**. Some of the popular automated information intermediaries are search engines, filtering software, expert and knowledge-based systems and electronic brokerage.



### 15.5.1 Role of Internet in Intermediary Functions

The Internet is a resourceful and vast source of information which provides various types of information in multiple formats. The Internet resources are available in web sites, web pages and web portals. Both commercial and non-commercial organisations as well as some persons maintain these Internet resources. One Internet resource can be linked with other Internet resources through hyperlinks. The hyperlinks enable Internet users to navigate from one source to other sources for getting relevant information. But accessing appropriate information through Internet is a complex process that requires the services of Internet search engines. Internet Search Engine is a facilitator that provides search facilities to exhaustive sources of information available in cyberspace. An Internet search engine is a website that maintains directory of databases of other websites. It is a service that indexes, organises and often rates and reviews websites. It helps users finding needed information that is relevant to them. It quickly searches millions of web documents in a few seconds or minutes for an entered search query. Well-known, commercially backed search engines generate more dependable results. These search engines are well maintained and upgraded regularly, to keep pace with the growing web spaces. Yahoo! was the first web search engine to gain worldwide attention.

Presently, Google, Yahoo!, and a few others are dominating international market of Internet search engines. Google and Yahoo! search engines have powerful search capabilities and they extend their search capabilities to other search engines with mutual agreement. Some country specific, subject specific or document types specific search engines also exist. The National Informatics Centre (NIC) of India maintains web directories for government departments, institutions, programmes and documents, which can be searched through its website <<http://goirectory.nic.in>>. Some search engines are powerful to generate relevant search results for some specific kinds of documents like, articles, news, music, movies, etc. Google's *Scholar* can generate search results from scholarly communications like journal articles, conference articles, and research reports. Similarly, LookSmart search engine has strong indexes for magazine articles.

Internet search engines are mostly commercial enterprises, and their revenues are generated mostly from the advertisements. Advertisers sometimes pay for getting higher ranks in search results. Thus, commercial search engines sometimes provide biased results favouring their advertisers.

If the Internet search engines are automated information intermediaries, there are some meta-intermediaries too that provide information about information intermediaries. The [searchenginewatch.com](http://searchenginewatch.com) is a meta-intermediary that provides information about various search engines.

### 15.5.2 Filtering Software

The advent of electronic presentation of information has made the information filtering process simpler. One of the earliest forms of electronic filtering was the SDI service, which was designed as an automatic way of keeping researchers, or professionals informed of new documents published in their areas of specialisation. Alert services of various web-based information providers also adopt filtering techniques to inform the users on the recently published materials.

The exponential growth of Internet information resources has stimulated the use of collaborative filtering algorithms as recommended systems. Collaborative filtering automatically retrieves and filters documents by considering the recommendations or feedback given by other users to the documents. Such systems leverage knowledge about the known preferences of multiple users to recommend items of interest to other



users. Collaborative filtering methods have been harnessed to make recommendations about such items as web documents, web pages, multimedia resources, and other items. Researchers have proposed and evaluated many approaches for generating recommendations. There are a number of filtering systems or softwares for the purpose. Some of the filtering systems are freely available.

The filtering software is an automated tool to access electronic information sources. Filtering software provides rating based information, accumulated from similar group of users. It sometimes restricts some unwanted or irrelevant information sources from the whole range of information sources. It has strong algorithms that take care of some reparative (corrective) tasks as well as some distinct tastes or preferences of users. Some filtering systems are available freely, whereas some others are available on a commercial basis.

### 15.5.3 Expert Systems

Expert systems, sometimes called 'knowledge-based systems', 'knowledge systems' or 'intelligent systems' are computer programs that represent knowledge and apply expertise to manipulate the knowledge and to achieve solutions. These systems can be useful for online searching. Now, most online searches are done by human intermediaries, creating both an information bottleneck and the possibility of the misinterpretation of human need. This has resulted in an extensive research of knowledge-based systems as online search intermediaries. Expert systems can be stand-alone or embedded in another type of system such as a database management system. Generally they are comprised a knowledge base, an inference engine, and a user interface with the capability to show reasoning behind their conclusions. All the knowledge needed for problem solving is incorporated in the knowledge base. The inference engine applies the knowledge held in the knowledge base. An understanding of the skills and knowledge underlying the intellectual components of the search process are essential for creating an expert intermediary system. Since the late 1970s prototype expert intermediaries have been designed and developed that perform a varieties of tasks:

- a) **Search Advisors:** These are expert intermediary systems that aim not only to assist or advise users but also train them in online searching.
- b) **Intelligent Front Ends:** Expert intermediaries that act as intelligent front ends to online services are closely related to advisory systems. Their primary aim is to provide trouble free access to online services. Unlike reactive advisory systems, these front ends intervene in the search process to a greater or lesser extent.
- c) **Intelligent Intermediaries:** These systems draw on knowledge of users and search tactics to interpret and elaborate search requests. They use knowledge of the concepts represented in a document base to affect retrieval and thus, ignore many of the problem-solving tasks associated with human information intermediaries.

Besides, expert systems in other areas like experts in query formulation; experts in retrieval in specific subjects and user modelling are experimented. In user modelling, by building a model of the user, an expert system can tailor its performance to a range of users.

Expert or knowledge-based systems use sophisticated techniques of artificial intelligence and neural networks in generating desired results. Presently some web-based information systems have adapted algorithms of expert systems to serve their clientele very intelligently. Examples of Internet-based Expert Systems are:

- a) **The Coatings Guide Expert System (CAGE):** It produces a recommendation for industrial users to use the least hazardous appropriate paint or coating.



- b) The Expert Systems for Thermodynamics (TEST): It is intended to help students and professional engineers solve general problems in thermodynamics.
- c) The Reptile Identification Helper (RIH): It aids in the identification of field specimens as part of an ongoing census of amphibians and reptiles in Pennsylvania known as 'Pennsylvania Herpetological Atlas'.

### 15.5.4 Electronic Brokerage

The brokers in the financial markets are the intermediaries between the companies and shareholders. Presently online trading of tradable shares, financial securities and financial bonds can be performed in many stock exchanges. The brokers provide various services for financial assets management as well as portfolio management of the investors. The investors can get decision-making sophisticated information from the brokers. Electronic brokers use the Internet resources to provide free, searchable company and industry information. They accumulate commercial information and provide advisory services to the investors, where some experts are also involved. This type of information intermediary provides decision-making information to the investors without any charge or fee, but earns profits from the financial transactions made by the investors.

#### Self Check Exercise

- 6) Discuss the role of Internet in information intermediary's functions.

**Note:** i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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## 15.6 INFORMATION INTERMEDIARIES IN INDIA

In developing information services in India, some of the functions of information intermediaries are getting prompt attention of Indian institutions. In the agricultural field, extension workers have been performing the linking functions between agricultural scientists and farmers for a number of decades. In the rural and urban settings, paramedical professionals, block development officers have been providing services that link users and information. Many of the commercial organisations and research institutions, both in the public and private sectors are alive to the importance of role of information intermediaries. In some of the institutions like the Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), Pharmaceutical R & D Centres and such other research organisations, the impact of the services of Information Intermediaries can be visible, these institutions having been aware the value of such services.

## 15.7 SUMMARY

The growth of information and the need for its speedy access have resulted in the development of a group of distinct information professionals known as Intermediaries. They are basically middlemen serving as a link between producers and users of

information and functioning in different types of activities such as collection, analysis, consolidation, repackaging of information on behalf of the users. This group of professionals normally operates at the different groups of users in different fields. They are designated by various names, but basically function as a linkage between the users and information sources. Presently, both human as well as some automated systems are functioning as information intermediaries. With the development of the sophisticated information and communication technologies, intelligent agents are expected to increase in future. In the context of computerised information retrieval, expert systems, filtering software, search engines and electronic brokerage have been developed to perform many of the functions of information intermediaries.

In the present environment in India the concept of Gatekeepers, Information Consultants and Extension Workers and Paramedical Professionals is becoming increasingly popular. Most of the commercial or industrial organisations and research institutions both in public and private sectors are alive to the importance of information intermediaries. In some of the institutions like Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), Pharmaceutical R&D centres, and other research organisations, both in public and private sectors, we observe the impact of this type of information intermediaries.

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## **15.8 ANSWERS TO SELF CHECK EXERCISES**

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- 1) 'Information Intermediaries' refers to those persons or organisation whose main aim is to provide information to its clientele. They are neither the producers nor the consumers of information. They basically work as middlemen whose sole aim is to link the sources of information with the users of information.
- 2) For effective transfer of information, the Information Intermediaries must possess the following specialised skills:
  - i) effective communication skill
  - ii) mental capability to analyse and interpret things easily
  - iii) manual skills such as keyboarding or data entry operations
  - iv) capability of quick online searching.
- 3) The three basic functions of the Information Intermediaries are:
  - i) Searching of Data and Information: This function involves Identification of the user's need, the development of Search Strategy, Identification of the Sources of Information and finally accessing the data or information.
  - ii) Analysis of Data and Information: After accessing the data or information, the next step is to analyse it properly and consolidate the information according to the user's requirement.
  - iii) Disseminating Information in the required form: The data or information acquired is consolidated and repackaged in the form of state-of-the-art reports etc. and finally given to the consumers of information.
- 4) Information Broker refers to those individuals or firms who provide information services for a fee. Information Consultants on the other hand refers to those persons or firms who are involved in designing, management, giving advice, etc., for a fee. The basic difference between these two is that the broker provides information on demand. While the consultants tell what to do with information and how to do it.



- 5) The services of online vendors have changed significantly after proliferation of Internet-based online information services. Internet offers low-cost method of accessing bibliographic and full-text databases, which are easy to search, navigate and retrieve. Thus, online vendors now becoming an extinct species, and these firms have changed their mode of delivery of services through Internet, instead of dedicated telecommunication networks. They presently perform most functions of information brokers and some functions of information consultants on profit basis.
- 6) The Internet acts as information intermediaries in many ways. The Internet resources are very vast and scattered in millions of websites, web pages and web portals. So, accessing appropriate Internet resources is a painstaking task. A number of intermediary functions are available through Internet that link between information sources and users. Internet search engines, collaborative filters, expert systems, subject gateways and some other sophisticated automated systems provide a number of utilities for accessing specific information in specific formats in necessary depth. Some other information intermediaries also use Internet technologies for providing speedy, accurate and pinpointed information supports to their professional clientele.

## 15.9 KEYWORDS

- Consolidation and Repackaging** : The technique of analysing, evaluating, repackaging, sifting information and finally putting it in proper perspective.
- Collaborative Filter** : A personalised recommender for users on information obtained from other ideally likeminded users.
- Expert Systems** : A set of computer programs that guide the user to locate and use information.
- Extension Workers** : Persons who collect, assimilate, repackage and disseminate information. Normally, they function in rural and semi-urban areas.
- Information Analysis** : The methods and techniques of identifying the essential concepts, which may be useful for the user's requirements.
- Invisible Colleges** : A group of persons informally forming a group for exchange of information and ideas.
- Listserv** : An Internet-based discussion forum, whose members form a homogeneous group on similar interests.
- Referral Specialist** : A person or a group who acts as a middleman to link the user with the information sources.
- Search Strategy** : A conceptual schema developed to locate information from a file.
- Technological Gatekeepers** : The experts in an organisation who keep track on the latest information on a subject and guide or provide the colleague users with the required information. These persons are available mostly in S&T organisations and function informally.

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## UNIT 16 DATABASE DESIGNERS AND MANAGERS

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### Structure

- 16.0 Objectives
- 16.1 Introduction
- 16.2 Information Systems and Databases
  - 16.2.1 Information Systems
  - 16.2.2 Databases
- 16.3 Database System Design and Development
  - 16.3.1 Phases of Development of Database
  - 16.3.2 Role of Consultants in Information System Design and Management
- 16.4 Information System Professionals
  - 16.4.1 Operation-Oriented Professionals
  - 16.4.2 Technology-Oriented Professionals
  - 16.4.3 System-Oriented Professionals
  - 16.4.4 Management-Oriented Professionals
  - 16.4.5 Information -Oriented Professionals
- 16.5 Information Professionals as Resource Persons
- 16.6 Role of Database Designers and Managers in Training Users
- 16.7 Summary
- 16.8 Answers to Self Check Exercises
- 16.9 Keywords
- 16.10 References and Further Reading

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### 16.0 OBJECTIVES

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After reading this Unit, you will be able to:

- explain the terms - Information Systems, Databases, Information Systems Design and Management;
- understand the role of database designers and managers in the context of various resources of information;
- identify the skills, knowledge requirements, training of information experts;
- define the role of database designers and managers in a given organisational set up; and
- perceive the role of information professionals as potential resource persons.

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### 16.1 INTRODUCTION

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This Unit describes how database designers and managers serve as an important link in information dissemination and also as a source of information. The role of information

experts in designing and managing databases is described. The basic skills, knowledge, and attainment of information experts are examined. The requirements for designing and managing information systems are identified. How the database designers and managers play an important role in educating the end users of the databases is analysed. The training and motivation aspects in respect of the database designers and managers are discussed. Lastly, the role of information professionals as resource persons is also highlighted. To understand and appreciate the role of database designers and managers in information dissemination, it may be worthwhile to revise our understanding of some of the basic and relevant concepts such as information system, database, etc.

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## 16.2 INFORMATION SYSTEMS AND DATABASES

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### 16.2.1 Information Systems

The term information system is used in many branches of computer and information science with significantly different meanings. In practice, this term is used in a very general sense, both in technical literature and in general publications. For example, in Computing Reviews, information system is a major category that has sub-categories: models and principles, database management, information storage and retrieval, and information systems applications. Sometimes, the term information processing system is used when the focus is on the “processing” of information rather than on its use. Some of the definitions of the information system, commonly used in the literature, are given below.

Dictionary of Information Technology and Computer Science defines “information system is a system within an organization that processes and distributes the information needs to plan, monitor and control its activities” It includes people as well as technology. It uses a number of well-established technologies and operated by professionally trained manpower.

William S. Davis defines “information system as a set of hardware, software, data, human and procedural components intended to provide the right data and information to the right person at the right time. It is a set of interrelated components that function together in a meaningful way”.

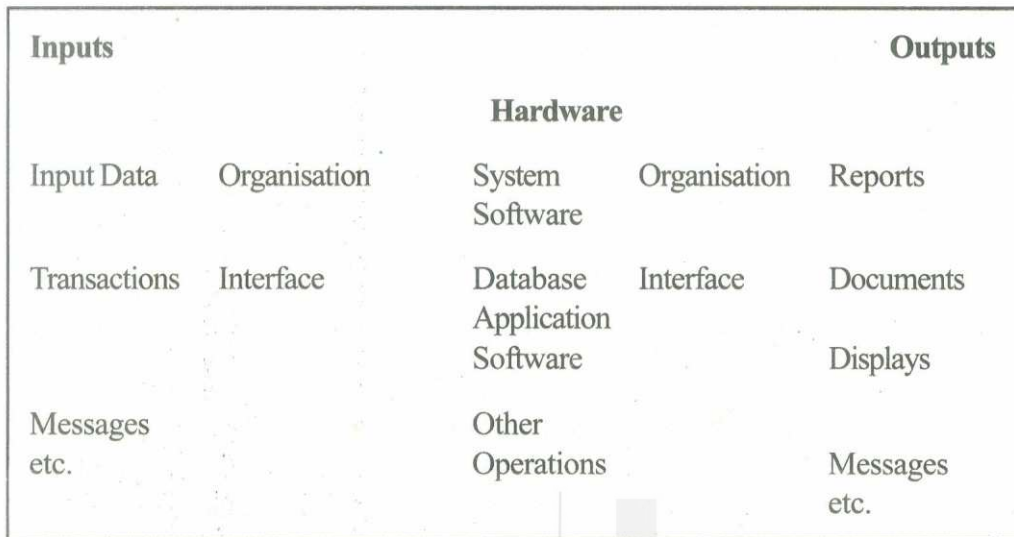
Encyclopedia of Computer Science defines “information system as a collection of people, procedures and equipment designed, built, operated and maintained to collect, record, process, store, retrieve and display information”. Further, it explains that such information system, particularly when it makes use of a computer, receives inputs, such as data reports, documents, messages, etc., which are stored in files of a database and generates outputs in the form of strings of symbols which may be again reports, documents, messages, displays, etc. Hence, we can see that an information system is not one simple activity but a complex of several activities. Accordingly, its design and management requires elaborate procedures. Keeping this definition in view, we find that the human mind is one of the oldest and complex information systems in nature.

Denis Connors, gives a general, broad, simple and direct definition: “all systems that produce any form of human readable data”. This definition may not be considered adequate because it has several limitations and excludes audio files.

Sage defines “an information system as an input-output structure, which acquires, stores and processes data and produces and/or disseminates information in an organised manner”. In brief, a system, which performs the data-to-information process, is called an information system.



Thus we can summarise that an information system is a collection of people, procedures and equipment designed, built, operated and maintained to collect, record, process, store, retrieve and display information. An information system may utilise various technologies. Basically an information system has the structure as shown in Fig 16.1.



**Fig. 16.1: Structure of an Information System**

(Source: Sage, 1990)

An information system accepts, stores and displays strings of symbols in the form of digits, alphabetical characters, special symbols, etc. Users of information system attribute some value or meaning to the string of symbols. The hardware component of the information system includes Central Processing Unit (CPU), input and output devices such as work stations, printers, readers, etc. In distributed information system, communication equipment also form part of the information system. Next is a set of system software including operating systems, utility programs, database management systems, etc. The application software, specially designed for a particular information system prepared in some high-level language and database where data is stored also constitute the components of the information system.

The information system can be classified in different ways for different purposes. It can be on the basis of application areas such as manufacturing, accounting, reservation, etc. another is on the basis of type of services rendered, degree of interactions with the user, and/or the environment in which the system is embedded. Some of the categories of information systems are given below:

***By the Type of Services Rendered:***

- Computing Service Systems
- Information Storage and Retrieval Systems
- Command and Control Systems
- Transactions Processing Systems
- Message Switching Systems
- Process Control Systems

***By the Degree of Interaction with the User:***

- Batch Processing Systems
- Sequential Processing Systems
- Store and Forward Systems
- Random Processing Systems
- Interactive Systems
- Real-time or Online Systems

***Hybrid Information Systems:***

- Business Data Processing Systems
- Management Information Systems

An information system is developed to meet the information requirements of the organisation. Different organisations use different information systems to meet the set objectives. Library and information professionals are concerned with the library management system, information retrieval system, etc. All information systems have certain common characteristics, like:

- Information systems are human-made i.e. they have to be designed, developed and operated and maintained.
- In the development and operation of information systems, both the software and database are important.
- There is a need for economy in developing the systems and which can be met by sharing software, hardware, maintenance and operation, etc.
- It involves human-machine communication at various levels, which require proper documentation.
- Users of the systems and the technology on which the systems were developed are continuously changing, therefore, there is need to update the systems to make them dynamic, responding to changes.

Information systems are quite expensive to develop and operate; consequently, they need to be analysed to determine whether they are serving the desired needs of users, as well as the measurement of their performance, continue to receive considerable attention.

**Self Check Exercise**

- 1) What is an information system?

**Note:** i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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The term “database” has no single definition that is widely acceptable. Usually, this term is used to identify a file where data records are stored on a media which a computer can read, write and access for example, magnetic tape, floppy, disk, etc. It is an organised body of related information. One or more large structured sets of persistent data, usually associated with software to update and query the data. A single database might be a single file containing many records, each of which may contain the same set of fields where each field may be of certain width.

Database is a collection of data organised to service many applications at the same time by storing and managing data so that they appear to be in one location. The major benefit of using a database system instead of a file system is that this can remove the data redundancy and consisting of the data in a system.

Database contains data in a structured form. For example, in a bibliographic database, the data pertaining to the name of an author, title of a book, its edition, publisher’s name and address, date of publication, price, etc. is recorded on storage medium in a structured form for accessing these individual data elements. The structure of a database, that is, the way in which the data elements in a record and the records in the database are arranged largely depends on the ultimate use or user of the database. For example, the circulation section has to maintain data regarding books issued to clientele. Therefore, in the content of a database used at the circulation section, three record types are important, namely, book description, transactions, and membership. Further, the book issued may be in demand by a number of users. In that case, a circulation queue or line is to be formed in a separate record as it contains information such as priority, date of issue, etc., that is different from transaction information. In addition, a record, which indicates all documents issued to a member, may also be required. From the database designer’s point of view, the nature of relationship among various record types is important. Some relations, like, transaction between a member and books are obvious and can be automatically retrieved by a query, but, the other relationships like who is waiting for the book, are not so obvious. Such relationships need to be built into the system. Hence, the database designer needs to define the relationship of record types at the time of developing the system. The data need to be manipulated by the programmers. Data manipulation may be:

- retrieval of data stored in the database;
- insertion of new data into the database;
- deletion of data from the database; and
- modification of data stored in the database.

Access to data is provided through application programming. The totality of the database along with the application programs for accessing the database is called Database Management System (DBMS). A Database Management System is a software package that is used to define, store, maintain and provide controlled access to databases. Hence, it is used for creating and accessing database and it always exists with the database. A database is one of the components of DBMS. Three major requirements in this regard are:

- i) **Privacy** identifies the capability to protect database against unauthorised access or changes. This requirement varies from one organisation to another and is more



critical in the context of online database systems as several users are permitted to make use of the database.

- ii) **Integrity** is the capability of the DBMS to protect the database from both hardware and software malfunctioning. Its ability in identifying the problem, reporting and reconstructing the damaged part of the database is critical. Further, the software should initiate the restarting process. This capability of the software is often referred to as "recovery" process. The data recovery process restores the database to a correct state after a failure. It protects the database from inconsistencies and data loss. In case the output of any information system lacks integrity, the organisation's decision will be based on the information that lacks credibility and thus the probability of faulty decision will be increased. Thus the integrity requires that information may be protected against unauthorised alteration.
- iii) **Data Independence** is another capability that is considered important from the user's viewpoint. This implies that any structural changes of the database should not affect the application program.

Database system evolved from file processing system. The IBM developed first commercial hierarchical DBMS in the 1960s, in which records were organised in a hierarchical tree structured form. Since paths and links between the records were predefined therefore retrieval in this system was very fast. During 1970s Network DBMS evolved and offered an efficient access path to its data and was capable of representing almost any information structure containing simple types. It was more flexible than hierarchical DBMS. Relational Database Management System (RDBMS) was developed by E F Codd at the IBM San Jose Research Laboratory and was based on the concept of relational data model in which data and relationships were represented in tables that were composed of rows and columns. Each column had a unique name and data type. A data value could be stored in at the intersection of each row and column. Now many RDBMS are available like Oracle, Access, FoxPro, SQLServer, Infomix, Sybase and Visual Base. Object-Oriented Database Management System (OODBMS), based on object oriented data model, was defined by Kim in 1991. In this system, database was developed in the form of persistent and sharable objects supporting object oriented principles. Some of the examples of OODBMS are Jasmine, GemStone, O2, Object Store, Versant ODBMS, etc. In 1990 Stonebraker and others suggested extending capabilities of a RDBMS to include support for richer object structures and rules. As a result Object-Relational Database Management System (ORDBMS) evolved. It is a hybrid of the RDBMS and OODBMS, which allows users to take advantage of OODBMS and to maintain a consistent data structure in an existing relational database. Examples of ORDBMS are DB2, Dynamic Server, Oracle 8i, etc.

For the design and development of the information system or in other words, the database system, data management is the vehicle. Data can be considered to imply information also. The best example for information being interpreted, as data would be the word processing files used as data in a record.

The function of collectively managing i.e. controlling and providing access to data becomes data management. The design of an efficient database system contributes to the effective management of its organisation. Throughout this Unit, database system is used synonymously with information system.



- 2) Define a database management system and name some of the DBMS.

**Note:** i) Write your answer in the space given below.  
ii) Check your answer with the answers given at the end of the Unit.

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## 16.3 DATABASE SYSTEM DESIGN AND DEVELOPMENT

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Database system design and development is considered more a skill than an art; a manager, a user and even a layman in the database system (or information system) profession need to be actively participate in the development of the system along with the information experts who are responsible for the creation of the system. An understanding of the phases of development of the database system, will enable you to appreciate the amount of work and skill involved in the designing of such systems.

### 16.3.1 Phases of Development of Database

The development of every database is a project-oriented effort that follows a uniform pattern consisting of a series of activities structured to accommodate the development and implementation of the system. The major tasks can be divided into four phases:

- 1) Definition Phase;
- 2) Construction Phase;
- 3) Implementation Phase; and
- 4) Operational Phase

#### 1) Definition Phase

In the definition phase, an attempt is made to understand the true nature of the database and the objective or purpose for which it is created by means of an in-depth analysis of the aspects of the work involved as a step-by-step process. This results in identifying specifications required for designing the system and flowcharting. Flowcharting can be illustrated by developing a work flow chart of a particular activity of a large library. Here (Fig. 16.2) purpose of classification is used as an example. Once the phase of developing logical flow diagram is over, it will be a matter of time to convert into the artificial language of the computer i.e. to develop a program. Based on the user's /organisation's requirements, a detailed flow diagram has to be prepared. One has to conduct a study and analyse the interlinked components before finalising the flow diagram. One can observe the flowchart given in figure

16.2. At boxes marked 'A' the actions are all unit activities without involving any complex intellectual activity. On the other hand, boxes marked 'X' are all complex activities, which may involve intellectual work. So far, sub-activities marked 'X' have not been automated fully by the libraries; but sub-activities marked 'A' can be fully automated or partially automated. For automating the activities marked 'A' a database of library holdings is required. Thus, the feasibility of automating various activities within a section can be identified by this process. This also leads to the study of technological capability required to manage the data at hand and the extent of automation feasible. This process also helps in taking into account the cost factor involved in the process of automation.

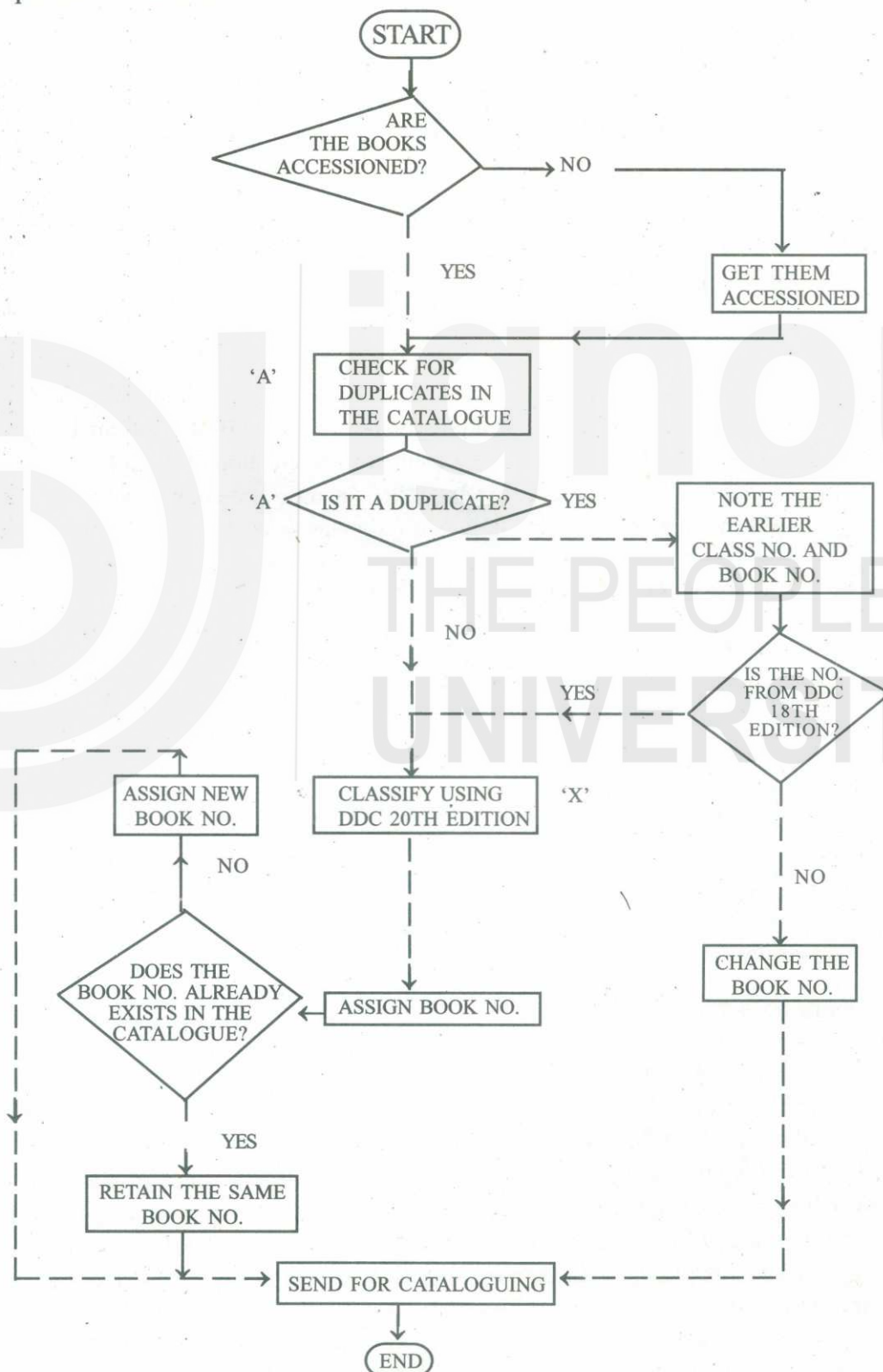


Fig. 16.2: Flowchart for Classification of Books Using DDC 20th Edition  
(Library earlier used DDC 18 Edition)



## 2) Construction Phase

In the construction phase, programs that generate output specified by the given input are developed. Procedures that require human involvement in implementing the system are documented.

Once the feasibility study identifies the areas of automation, the construction phase has an important role to play in the development of the prototype and the full-fledged system for implementation. Some of the design attributes that are vital to successful development of a database system are: (1) flexibility; (2) simplicity of maintenance; (3) compatibility; (4) interface with related systems; (5) expandability; and (6) efficiency. These have been discussed in the following sections in brief.

### ● Flexibility

Flexibility is defined as the capability of an information system to cope up with changes in user's requirements in the later stages of development. Flexibility permits incorporation of changes pertaining to new items, new report requirements, etc. The changes in data processing relate to:

- 1) Data change;
  - 2) Parameter change; and
  - 3) Procedure change.
- 1) **Data Change** relates to changes in processed data. They may be in the form of new fields being added to the data records or change of actual data. However, they do not normally affect the processing. Especially, with current sophisticated DBMS systems, such changes can be easily incorporated.
  - 2) **Parameters Change** for example, in the circulation activity of a library, the change of constraints in a fine deduction formula for an overdue book. But this does not affect the calculation. The required change need not be incorporated in the program, if the program is flexible, a parameter file can be created and data from the file can be used for calculation so that any change of the parameters will be incorporated only in the files.
  - 3) **Procedure Change** is the third and important change, which pertains to the actual changes in the program. But, if the program is modular in structure, then it becomes easy to modify without affecting the related programs.

### ● Simplicity in Maintenance

Standardised programming techniques and perfect documentation facilitates the maintenance system. Documentation is the most vital activity for maintenance of the system. Simple documentation is the basic approach to simple maintenance.

### ● Compatibility

The information processing technology is advancing so rapidly that a system designed with certain hardware and software has to be upgraded or to be replaced as early as possible. A switchover, from an old to a new system depends on how compatible the present operations are with the new ones. Choosing the appropriate programming language and necessary platform to develop the information system is very crucial. This exercise needs to be carried out very carefully.

- **Interface with Related Systems**

Most information systems transmit and receive data from related systems using signals or other means. This is known as interfacing. Interfaces provided on the system should enable the system to converse with other systems.

- **Expandability**

Every information system is capable of handling a certain amount of data. This affects processing time, response time, memory requirements, etc. The system should be capable of tolerating a certain degree of increase in volume i.e. expandability. Management should be aware of the limitations otherwise it may lead to jamming of the system.

- **Efficiency**

Efficiency implies response to queries in time. This can be recognised in terms of factors such as time delays, user-friendly messages, helping commands, menus, etc. which facilitate a user in achieving his/her objectives within the system's capability with reasonable ease and time.

### 3) **Implementation Phase**

The implementation is the third phase of the development life cycle following the definition and construction phase. This is the phase where logical design specifications are translated into the actual instructions code and operating specifications of the operating system. It also includes training of the personnel operating the system, test runs and user acceptability modification through feedback mechanism. The phase deals with actual installation of the developed information system. It involves issues such as training, conversion and procedural changes. The training should be given to users of various ranks who might not be familiar with Information Technology (IT). The training in implementing the system can be looked at from two points of view - (i) Ideological Training, and (ii) Operational Training.

- i) **Ideological Training** is given to the managers as they control the operational staff. They should be well informed about the goals of the system, benefits that can be availed from the system, constraints, limitations, and its organisational and functional implications. The training provides detailed information regarding the need for the system, why it has to be improved in the given work situation, what the attributes of the system are - such as, data accuracy, response time, etc. are meant for how the new system affects the structure and authority and what is the human role in the system.
- ii) **Operational Training** is concerned with the operational aspect of the system familiar to the operating personnel. More about this will be discussed in a later section of this Unit.

### **Conversion**

Development of a new system requires conversion stage which involves procedural changes and operation of the new system with new procedures. This phase is very critical as it involves the preparation of system simulative activities i.e. while implementing the new system, the old system may have to some degree of conversion from old system format to the new system format. Thus the next aspect of implementation phase is conversion. This conversion can be extensive if the old



system is a manual or is using very old hardware or software. The conversion continues in a parallel manner. Continuity of operations is essential to provide uninterrupted services. Before the implementation, three major issues of conversion have to be taken care of. They are the file conversion, the program conversion and the conversion of working procedures. File conversion process includes:

- Old system files need to be augmented with new system file additions.
- Programs need to be written to automatically convert old system file contents to the new system formats.
- At a specified period of time, old system file contents need to be downloaded to an off-line medium such as magnetic tape.
- The downloaded files and the off-line file augmentations need to be uploaded to the new system hardware using the file conversion program.

In the context of a library, if a new computerised system is to be installed, the major problem is retrospective conversion of data from manual form, to computer readable form. If the computer readable form is available, then it is easier to convert the data from one format to another. Procedures for updating the data have to be established. But, program conversion may not happen when a new system is installed. Only later revisions, inclusive of sub-program may have to take place. But if the change in the information system is related to hardware, then reprogramming efforts are needed. However, a prerequisite for program conversion is good program documentation. But, some manufacturers have translated programs, i.e. source programs written in one manufacturer's version to another's version. Further, new input forms need to be designed. Printing forms (in continuous form) have to be kept ready. Transmission timings have to be established. This requires contact with the printing department, telecommunication department, etc. Though individual operations are not complex, they collectively result in multivariate and a large volume of activities.

### **System Changeover**

After the conversion process is over, it is now time to discontinue the old system and begin use of the new system. There are three alternatives starting from parallel to direct modes.

Parallel changeover

Phased changeover or Staged changeover

Direct changeover or Instant changeover

### **Parallel Changeover**

In the parallel changeover mode, both old and new systems run parallel for a limited period of time. This entails operation of both the current and old systems for a period of time until everyone is comfortable that the new system works effectively. 'Trial runs' are conducted on the new system to feel its impact and the old is the actual 'live' system. Only after the new system runs satisfactorily, the old one is scrapped. At a later time, the new system is real and the old is still maintained for backup and control. It is the safest of the three alternatives, providing a safety. It is not cost-effective, since two full systems operate concurrently at the same time and the workload is doubled during the changeover process. It is most auditable, since the new system output can be compared transaction by transaction to the old system.

## Phased Changeover or Staged Changeover

The second form of changeover is the phased or staged changeover. The old system is discontinued and the new system is initiated one stage at a time. In this approach, the system is divided into modules, which are small in size. Each module is handled separately one after the other. This approach is feasible, only if segmentation is viable. There are two variations of this changeover alternative.

**Pilot:** This entails implementation of a complete new system at a single geographic location. Lessons learned from the pilot implementations, are used to fine-tune the system before implementation at other locations.

**Phased:** Modules of the new system are implemented consecutively rather than concurrently. If one module is implemented and operating effectively, the next module is implemented. Thus the whole system will be replaced in phased manner.

## Direct Changeover or Instant Changeover

A cutoff date is established for the simultaneous discontinuance of the old system and full operation of the new system. It is a preferred approach of changeover as it is less costly because there are not two separate systems operating at the same time. It is also less confusing as there is only one set of inputs and outputs. It has the stronger commitment, since the old system no longer exists to fall back on if the new system fails. On the other hand it is riskier also as if the new system fails, the old system no longer exists. It is very complicated and troublesome. But, sometimes it is a must. The cost of changeover from old to the new and the efficiency in terms of response time, which contributes indirectly to the cost, are very vital. They relate to personnel required for changeover planning, personnel for performing conversion, computer time, computer servicing agency, special equipment, construction costs, materials and supplies, etc.

## Testing

The last part of the work in the implementation phase pertains to testing because development of an information system is incomplete unless it is exposed to the practical environment. Testing usually starts from loading and testing the system. Especially, while implementing costly systems, it is essential to test them thoroughly before installing. As a part of such exercise, program testing is basic to computerised or database management system design. Preparation of test data and running the data on the programs are crucial to understand the results or outputs. It is important to note that the test data should be prepared by someone other than the program designer as the programmer might have misinterpreted the requirements and may not recognise some errors in the program. No one also would like personal errors to be pointed out or discovered, therefore, the same designer of module should never test the module. It can be tested either bottom-up or top-down approach. Program debugging is something different from formal testing. It is essential that thorough testing be done because efforts required to change the program can be many a times greater after implementation than before. There are four quality dimensions to be tested:

- i) **Functionality measures** the external quality of the system.
  - Correctness. Are system outputs accurate and complete?
  - Reliability. Do functions perform consistently without failure?
  - Integrity. Are results consistent with user expectations?



- ii) **Engineering measures** the system's internal quality.
  - Efficiency. Are functions performed in minimum time with minimum lines of code?
  - Testability. Can modules be tested and audited easily?
  - Documentation. Has the system been documented to allow easy future modifications?
  - Structure. Is the software system organised logically to facilitate training?
- iii) **Adaptability measures** the system's future quality.
  - Flexibility. Can the system be adapted to the changing needs of the user?
  - Reusability. Can modules be reused in other systems?
  - Maintainability. Does the organisation of the system facilitate future changes?
- iv) **Usability measures** the system's ease of use.
  - Learning time. How quickly the user can learn the system to use?
  - Performance speed. Does the system maximize transaction throughput?
  - Error handling. Does the system provide users with adequate and helpful guidance to detect and correct errors?
  - User satisfaction. Is the system designed so that it is not a constant source of user annoyance?

After individual programs have been tested, the entire system should be examined in its entirety. This test will focus on the interface between the programs, particularly the transfer of data from one program to another and the handling of files shared by two or more programs. Such tested programs are handed over to the user. If the user endorses the results, the system is accepted. It is indirectly a checklist for testing - smooth running, full documentation, and trained personnel, clear operating procedures, etc. However, the user has to determine the criteria for the acceptance of the software.

### **Benchmarking**

Benchmarking is the process of identifying, understanding and adopting outstanding practices from an established source of repute to help in improving the performance. It helps in attaining the target, improving process, increasing efficiency, user satisfaction, continuous improvement and generating and promoting world-class performance. The newly developed information system should be benchmarked with the existing information system which is already running successfully to get an error free and user-friendly information system.

### **4) Operational Phase**

Once the users are satisfied with the implementation, it is turned operational, incorporating necessary changes desired during implementation. During this phase, maintenance of the system, which involves among other things, error discovery, changing of hardware, facilitating change of software and configuration is taken care of.

After the system has passed through acceptance testing, it becomes operational. In other words, it interacts with the environment in a dynamic manner. Still, errors might occur and changes may be required. A user, in the form of system operator is viewed sometimes is the one responsible for only input of data and the receipt of output. However, another viewpoint is that they have to be more responsible while the

technical department provides only facilities and support. Often the second viewpoint is more prevalent as the system operator's participation is crucial for understanding an information system. The information system department is responsible for carrying out normal operations, handling changes requested by the user, analysis of change request by an information analyst, program changes by a programmer, etc. This division of duties appears to be complex, as the appropriate functional division alone can act on the request. Each information system department is managed by a maintenance programmer. This person has to check the correctness of the program or change the program. Whenever a change is made, it follows a sequence of activities - filling in a change request form, analysis of the cost/benefit implication, decision making, selection of an appropriate design and program testing, updating documentation, and releasing a revised version for use validation. After the installation of the database system, it is operationalised. However, its effectiveness in the long run can be established via frequent evaluation. This process is called post-evaluation. It will be beneficial to understand the functioning of the system that will provide an insight to improvements. In this process, the quality of the system and the quality of the planning process will be investigated and reported. This report will be of great value in long range planning.

Once the system is designed, developed and made operational, it has to be tuned to suit the requirements of the user. This tuning process will be continued till any problem is identified and through the lifetime of the system. It also requires continuous monitoring including collection of performance statistics, storage statistics, etc. If the designed system does not meet the expected objectives, it has to be rechecked at every stage of the development.

### **System Auditing**

It is performed if any tampering with the system is suspected. It requires monitoring the activities to uncover suspicious or inappropriate use against the system. It consists of reviewing the log to examine all accesses and operations applied to the system during a certain period of time. The System Administrator keeps track of all operations in the systems that are applied by a certain user during each login session. He/She records the user's account name and access activities. When an illegal or unauthorised operation is found, the Administrator must be able to detect the user performing this operation.

### **Backup**

It is always advisable for the Administrator to make backup copies of the database and log files at regular intervals and to ensure that the copies are in a secured location. In the event of the failure of the system, the backup copy and the details captured in the log file are used to restore the database to the latest possible consistent state. It is recommended that the log file be stored on a disk separated from the main database files. This reduces the risk of both the database files and the log file being damaged at the same time.

### **Documentation**

Once the system is designed, developed and tested thoroughly, it has to be well documented. The documentation should be explained in a lucid manner so that the user can use system. It falls into two categories:

- 1) Development Documentation; and
- 2) User Documentation.



**Development Documentation:** It comprises those texts that support programming activities required to produce the computer programs. Under this category the documentation team prepares specification document, project plan document, internal code document, test/usability report, maintenance document and system document.

**User Documentation:** It comprises those texts that teach, guide and support work by novice and experienced users. It refers to texts directed to an audience of users of the system and it consists of description of the system, different modules, and menus structures like data entry screen, interfaces, and instructions like how to enter data, etc. The basic purposes of user documentation are how to learn, how to use, and how to understand. Finally, these three purposes relate roughly to three kinds of documents: tutorials that teach, procedures that guide action; and reference manual that explain in detail. Procedure documents are based on step-by-step units organised into segments that follow the user's workplace activities. It includes user's guide and online help. The user's guides lead or guide the user from one action to another. Online help is an online equivalent to the user's guide.

All these phases put together are called the **Information System Life Cycle**.

The personnel required for the completion of the information system life cycle are those who manage, design and operate the system. Such personnel require special skill and knowledge. The skills, knowledge, information needs, etc. of such personnel are being discussed in the next few sections of this Unit.

### Self Check Exercise

3) What are the various phases of database system design and development?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 16.3.2 Role of Consultants in Information System Design and Management

Consultation is a common organisational and social process in which professional advisers attempt to help a client or organisation to solve a current or anticipated problem. A consultant may be an expert or a group of experts qualified through education, experience, and technical ability to advise or assist on a professional basis in identifying, defining and solving specific problem involving the organisation, planning, direction, control and operation of a system. A consultant serves as an impartial, objective adviser and is not an employee of permanent in nature. He/She brings out changes in the system, as it demands. With the pace of change, the dimension of many organisations, and the complexity of today's environment, greater attention has been drawn to consultants who can bring additional skills, knowledge and experience into the system in order to facilitate the change.

With the advancement of the technology, it has become easy to buy information and communication technologies - a variety of them at affordable prices. As a result of this development new databases and techniques for storing and retrieving information

are emerging very rapidly in response to a steady growth in demand for such services. Further, advancement in software and technology has led to the design of user-friendly systems, i.e. systems that can be operated directly by the users themselves. With the proliferation of these, a number of consultants have come to support such information works as database creation, programming, system designing, etc. The increase in the number of such consultants in the library and information science profession has led to the publishing of directories for example, a Directory of Consultants and Researchers in Library and Information Science has been published by ASLIB, London. With this development, the demands for guidelines for consultancy service has also come up in the library and information science profession. Many experienced professionals leave their companies and start consultancy firms. In countries like USA, Canada, and UK there is a high degree of selectivity, while choosing a consultant.

The consultants help in creating a detailed specialisation for evaluating various vendor developed software. They also evaluate the software in terms of their cost, specification, sophistication, reliability, company profile, etc. As most organisations cannot afford to have their own database designers, they go for the purchase of software available in the market. In this process they hire a consultant who can advise them on the right software and hardware that meets their present and future needs.

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## 16.4 INFORMATION SYSTEM PROFESSIONALS

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As we have already noted that a variety of personnel are involved in designing, operating and implementing of information system. To operate the information system, suitably skilled and trained professional manpower is required. The quantity of manpower would depend on the size of the system, number of users to be served, variety of services to be rendered, types of hardware and software, types of databases and networking, etc. These may be managers, administrators, coordinators, specialists in their fields and so on. These professionals may be designated differently in different organisations. However, they can always be grouped into the following main categories – namely:

- 1) Operation – Oriented Professionals
- 2) Technology – Oriented Professionals
- 3) System – Oriented Professionals
- 4) Management – Oriented Professionals
- 5) Information – Oriented Professionals

### 16.4.1 Operation-Oriented Professionals

The operation-oriented professionals are those involved in routine operations of existing information system rather than analysing, designing and developing new system. They perform duties pertaining to execution of an existing system. Thus, the information system created by the combined efforts and interactions between the system specialists and technology specialists is run by the operation-oriented professionals. These include the following professionals:

- **Data Entry Operator (DEO)**

Data Entry Operator is also called Keying Operator who converts source data into a machine-readable form and enters into computer. His/Her job is to key-in the data



recorded in written formats to produce computer readable data, get the print out or display the data and make a proof correction. He/She must know the ABC of computer operation i.e. to the extent of entering data in the system. Besides entry of data, he/she also makes proof corrections of entries on the screen of the computer.

#### ● **Computer Operator (CO)**

A person whose job is to operate a computer system. He/She acts on instructions received from the system analysts and programmers who produced programs that are in run. This person works in the computer room and takes care of the routine operations. He/She should be capable of mounting of the storage media such as magnetic tapes, disk packs on to mass storage devices when they are needed, look after peripherals, such as printers, scanners, CD drives, juke box and distribute computer outputs to wherever required. He/She should be capable of understanding system messages and reacting to them suitably using the console. The CO need not be a master in programming but he/she should have some background knowledge about information systems and a good command over the operating system in use. He/She should be fully aware of the hardware and software and also the capabilities and limitations of the computer in terms of speed, access time, storage space, etc. Skilled operators are more than an asset in handling and maintaining systems. In large computer systems installations, COs are experts in getting the best out of the equipment using the features built into the operating system to do so.

#### ● **File Librarian**

The File Librarian is responsible for managing the magnetic tapes, diskettes, disk packs and CDs that have to be catalogued and stored. This person should have some knowledge of information processing. It is, however, not necessary to have special technical skill.

#### ● **Clerks**

A variety of clerical works, such as job set up, distribution of output and control of errors in the data, etc. are handled by clerks. They need to have some knowledge of the procedures followed in the system and modes of operating the systems.

### **16.4.2 Technology-Oriented Professionals**

The persons who belong to this category are skilled persons who have extensive knowledge about Information Technology, hardware and software. They not only deal with system development but also with maintenance and operation activities that require a high degree of professional skill and knowledge. A variety of personnel fall into this category are listed below:

#### ● **Applications Programmer**

The applications programmer develops programs for user applications. He/She designs programs to meet requirements of a particular individual or organisation with an operating software which helps individual or organisation of a particular type of computer equipment to manage its operation and exploit its full capabilities. He/She needs to have mastery over a number of programming languages and in turn he/she should be capable of transforming programming specifications into concrete programs. He/She compiles, debugs and tests the program. The application programmer works closely with system designer who submits program specification and tests the finished program.

#### ● **Systems Programmer**

The systems programmer is not involved in application programming. This person is an expert in operating system programming and other utility software. These softwares



are extremely complex and are mostly written in assembly language: It consists of tables, switches, pointers. The handling of the software requires great programming skill. The job is to rectify the malfunction of the operating system, installing new version of operating system, giving instructions to application programming, improving the operating system performance, writing sophisticated programs or routines. A systems programmer is a computer science graduate, specialist in computer operating systems and a highly competent programmer, who interacts with company technicians, application programmers, operators but seldom with the users.

#### ● **Hardware Coordinator**

This is not an essential category for a company or organisation unless the company has large scale computing facilities. A hardware coordinator is a technical person with a background in electrical and electronic engineering, communication and software. He/She coordinates with other members of information system and fulfills hardware requirements i.e. computers, workstations, terminals, printers, peripherals communication interfaces, modems and other hardware that are needed in the organisational network which will be attached with network and software as operating system and communication protocols.

#### ● **Network Manager/Communication Specialist**

The technical knowledge essential for this person is the technical know-how of the communication equipment in the context local area networks, computer networks, protocols, network security, etc. It has become essential to hire such personnel because of rapid growth in distributed processing. He/She needs to manage and detect faults in the network and to rectify them. He/She monitors the performance of network. He/She must be familiar with the configuration of network, accounting, security aspects of network and all devices like cables, interconnections, number of concurrent users, printers and their types.

#### ● **Database Manager**

The Database Manager records changes in the database files, translating the logical access requests issued by applications programs into terms of physical storage, and ensures that the integrity of security of data is maintained. People closely involved with the management of databases are referred to as Database Administrator.

#### ● **Database Specialist**

Here, it is essential to distinguish between a Database Administrator and Database Specialist. The former is involved in the design of the content of the database and thus belongs to the system-oriented category of professionals. The latter is more involved in the structure and internal layout of a database management system and is a technical man. He/She becomes the system programmer of the DBMS because he/she is knowledgeable about routines, tables and files. He/She is to manage and maintain DBMS, to insert new data and reorganise files, etc.

### **16.4.3 System-Oriented Professionals**

These people are professionals who are mainly concerned with users and to respond to their information needs. They should adopt a broad approach to information problems, rather than concentrate on the information processing technology. At the same time, they have to be adequately knowledgeable about the technical aspects. This is because they have to decide what should be handled by computerised systems and how it should be handled. They need to have close working relationships with each other and with the technology-oriented professionals. Some of the system-oriented professionals are:



### ● System Administrator

A person who maintains standards for user names, pass words, monitors system's resources such as CPU, main memory and storage organisations, etc. and takes remedial action to be taken to correct system's weaknesses which may lead to system's failure. He/She ensures least disruption to the system operation by implementing a contingency plan to handle system failures. He/She creates and implements an effective back up strategy for the computers/servers including protection and restoration of critical data. He/She maintains adequate documentation for daily startup, shutdown and emergency operational procedures for computers/servers.

### ● System Designer

One who defines the user's information needs and designs systems to generate the required information including defining the content and structure of input forms, output reports and files is a system designer. The system designer acts as an intermediary between the system - oriented professionals and the technology-oriented professionals. They are responsible for transformation of a logical framework defined by the information analyst into detailed specifications such as program structure charts, files, input forms and output layouts. His/Her knowledge and skill range from fundamental methods of programming, operating, keying and other procedures required for operation of the system. The system designers, in collaboration with an information analyst, can implement a database system and test it.

### ● Procedure Writer

The procedure writer's job is to document the procedures used by operators, keying operators, users, clerks, distribution clerks. He/She creates consistent, correct and functional procedures. Both system programmers and system designers are involved in the work. They have to master the technical skill for writing manuals.

### ● Data Administrator (DA)

Data Administrator collects, stores, and disseminates data as a globally administered and standardised resource. Data standards at all levels that affect the organisation fall under the purview of the Data Administrator, who is truly an administrator in the managerial sense.

### ● Database Administrator (DBA)

As the name implies, a DBA is a manager, whose role is to "ensure the integrity and control of well-planned development of the corporate data resources". He/She performs administrative functions with overall responsibility of data resources in an organisation. He/She plans the database and devises it to meet user's requirements. He/She has full control over the database system. Typical functions of a DBA include defining the information content and schema of database, determining storage and access means, and implementing backup and recovery strategies. Especially for DBMS, the DBA is a must. As a professional, he/she keeps track of the various files, standardises record format, data item labels, maintenance of data directory, and uniform currency of redundant data, etc. Over all, he/she is responsible for the design and management of database and for the evaluation, selection and implementation of the database management systems. He/She is charged with day-to-day hands-on use of the database system and daily interaction with its users. He/She is familiar with the details of implementing and tuning of DBMS. For example, he/she has the task of creating new user accounts, programming the software to implement a set of access controls, and using audit functions.



There is a conceptual difference between functions of a Data Administrator and a Database Administrator. In smaller organisations, the Data Administrator and Database Administrator are often one and the same, however, when they are different, the DBA's function is more technical. The DBA implements the database software that meets the requirements outlined by the organisation's Data Administrator and System Analyst. Both DA and DBA are concerned with the management of data, but at different levels. DA sets policy about determining the data an organisation requires to support the processes of that organisation. Whereas, DBA develops or uses data model and selects data sets supported in the database.

#### **16.4.4 Management-Oriented Professionals**

##### **● Project Manager (PM)**

A Project Manager is a facilitator who coordinates the team's effort and determines how the team's resources should be allocated to produce a working system that complies with a given set of specifications on time and within the allocated budget. He/She is responsible for coordination of activities from the starting point to operationalising the system. He/She does whatever to ensure that the members of project team can do their work. He/She ensures that required resources should be available to the team and deals firmly with the issues that impact negatively in productivity and quality. He/She coordinates the development of system specification, program development, prototyping, installing, analysing the feedback, etc. He/She interacts with the consultants during all these phases when a consultant is involved in the system development. His/Her knowledge and skill includes - computer simulation, statistical decision making techniques, etc. The action of a PM is not noticed if the project is ongoing smoothly and meets deadlines and executed within the time period. On small projects, the PM deals directly with all team members, whereas, in large projects, there is often a lead developer, lead graphic designer, lead analyst and they directly report to the Project Manager.

Project Manager constitutes effective and high performing team in which team members come together and work in such a way that individual's knowledge, skills and experiences complement each other and individual's and team performance is enhanced. In order to facilitate the Project Manager, a number of project management software packages are available in the market, which can be used for setting out tasks, milestones, responsibilities, relationship between tasks and interrelation between them. It suits to complete projects that may carry out over a long period of time.

#### **16.4.5 Information-Oriented Professionals**

##### **● Information Adviser**

This class of professionals is a category emerging out of requirements of information system design in the present day. Since the advent of new technologies, an information adviser's, role is getting defined more clearly. More about this category will be discussed in the later section. Earlier, the Information Analysts played this role.

##### **● Information Manager**

An Information Manager should be able to create a significant link between the user and the information needed by him/her. He/She has to keep abreast of changing needs and information seeking behaviour of the users; regularly monitor the changes in the requirements and dissemination of information; make aware of the users regarding techniques used in information retrieval; constantly evaluate the information system for improvement of its performance to serve the objectives for which the information system was designed and developed.



## ● Information Analyst

Information Analyst is a professional who carries out interaction between user and other professionals. He/She plays an important role in the context of information system development. He/She closely works with the other persons to determine the systems requirements. Basically, it is the responsibility of the System Analyst to manage the specific methodology so that the system can be developed or modified. The information analyst has to analyse user requirements and decide the hardware, software, manpower, etc. required for the establishment of the system. This person is responsible for the design of the logical skeletons of the system. The designers, and programmers will fashion its body. This role can be equivalent to that of the library professional's role in developing the automated library system. Skill in information analysis requires the uncommon combination of management and technical education. Though knowledge of programming is essential, mastery over it is not a must. But, work experience in system design and information analysis is a must. This person, after sufficient experience, can take up the role of a consultant for defining specification for developing information systems in his/her field of specialisation.

## ● Information Broker (IB)

Webster's Dictionary defines a broker as "an agent who buys and sells for a fee". An Information Broker actually has far more in common with an attorney or adviser than with brokers who deal in such things as real estate. They do not sell information and they do not take a fee for arranging such a sale, they charge fee for rendering professional service like doctor or lawyer. They are not really brokers of any thing.

The information broker does a specialised professional job. He/She is a professional who skilled in a number of areas. He/She is knowledgeable about the database specialities, its operation and exploitation for providing specialised information services — for example, they are knowledgeable about the use of factual databases and their contents. He/She searches the databases in response to a query with the help of a keyword acceptable to the system and generates an output, which is repackaged to serve the client's needs. IBs are also called intermediaries in the library and information science profession. If they are employed within an organisation, their services may be used by the community for providing information services to its own staff. IBs use a combination of online, offline and physical search techniques depending on the clients needs. He/She determines the appropriate method of obtaining the client's requested information within his/her budget. After retrieving required information, the IB presents in a manner most suited to the client. He/She cleans up, summarises, verifies correctness/authenticity of information before supplying it to the user.

## Self Check Exercise

4) Categorise the information systems professionals on the basis of their jobs.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 16.5 INFORMATION PROFESSIONALS AS RESOURCE PERSONS

Among the various information professionals discussed in the previous section, it is mainly the database designers and managers who really act as resource persons. "A resource can be defined as something or someone that you can use or refer to when you need information on a particular subject" as defined in Collin's College Dictionary of English Language. Further, someone's resource is his/her ability or capability to find solutions to problems, quickly efficiently and with initiative. Such knowledge can be attained only in an area of specialisation. Specialisation means the concentration of study in a single subject to the exclusion of others. The present day trend is of subject specialisation. Therefore, the information professionals are specialists in the areas of information system design, development, and implementation. With this background, we can view the characteristics of the database designers and managers as resource persons. Their knowledge capabilities relate to:

- up-to-date knowledge and application of new innovative methods for achieving the objectives of an information system;
- the ability to take a leading role in conceiving innovative ideas in designing an information system which is economical, efficient and suitable to a larger community of users and clientele;
- the ability to relate available and future Information Technology, to the needs of a specific situation and to facilitate guidance, help and consultancy to new approaches by providing meaningful; easy to understand manuals and documentation;
- fully conversant with capabilities of the latest hardware related to computer and communication and the manner in which it may be used to its optimal capacity, efficiently and cost-effectively;
- a willingness to identify the appropriate technology in terms of both hardware and software for design and development of information systems;
- capability to identify the appropriate technology in terms of both hardware and software for design and development of information systems;
- having close contact with other information professional colleagues in the country and abroad; and
- constant involvement in designing and developing information systems for different categories of users, clientele situated at different locations and institutional environments.

The database designers and managers acquire such capabilities through training, by understanding the latest products in the market, acquiring knowledge about the developments in the area of information technology, by reading latest available literature, attending workshops, conferences, seminars, exhibitions, etc. Knowledge gained through such an exercise equips them to play the role of resource persons and their role relates to:

- conducting feasibility studies to determine the possibility of developing and installing an information system; to suggest alternate acceptable scenarios; prepare the project charter that can be used as a guide for the completion of the project;



- exploring the solution that can be suggested to problems posed and the methodology of solving those problems by the proposed system;
- identifying the availability of the required technology for establishing the system (called technical feasibility);
- checking the conformity of the system with the master plan of the organisation and its priorities;
- establishing the economic viability of the system i.e. the relation between costs and benefits for the organisation;
- examining the acceptability of the system to its users;
- analysing the working of the present system i.e. what is being done at present; what is expected from the proposed system and why the present system cannot provide it effectively;
- conceptually designing the new system and translating it into structured specification (i.e. functional specifications) so that it caters to the requirements of the user;
- submitting a project plan for controlling all the activities for the development, implementation and operationalisation of the information system;
- preparing an activity plan that specifies dates, duration for each activity involved, in order of their execution;
- defining the groups of persons involved in conducting specific activities and functions and their responsibilities (called the organisational plan);
- preparing a personnel plan, by giving details about the personnel required for each individual activity in relation to time and duration;
- identification of the resources - such as people, computer time, materials and other supports - needed for the completion of the project;
- describing the training necessary for the participants in the system for maintain the system along with an indication of time and resource required;
- listing the variety of documents that will be prepared and developed during the project indicating the likely contents, deadlines and acceptance procedures; indicating the tools and procedures for testing the software and hardware in terms of program testing, system testing and acceptance testing;
- identifying the responsibilities of various persons for installing the system; designing the input and output data element files and database for the system; designing the methods of processing the data; preparing prototyping and other specifications for programs and procedure writers;
- partitioning the systems into modules and programs and identifying corresponding raw data sources, input data and files, processing and output data required;
- identifying system controls to ensure, capture and process valid and accurate data to generate accurate outputs, by avoiding and preventing unauthorised access to files. This leads to the control of input, processing, output, organising files and operations; and
- developing forms for specific input and output; and flowcharting the dataflow and processing.

To ensure that they play such a role in a perfect manner, they collect information from internal and external sources. This will be in relation to the design and development of the system on hand.

The internal information can either be record based or document based. It is obtained from data records, data files, office files, official documents, etc.

The external information pertains to information obtained from an outside source of information. For example, information about an automated system in another library. This basic documentation of information paves the way for effective design and development of the designated information system.

In spite of such extensive documentation and associated capability of the information professionals, these resource persons may play their role ineffectively and inefficiently.

This can be attributed to:

- making wrong assumptions about the needs of the users;
- not giving a pretest check to hardware and software;
- not providing people feedback about the work in progress;
- failure to overcome psychological barriers between the users and themselves;
- inability to relate and communicate with the user harmoniously;
- overestimating or underestimating the requirements;
- poor non-verbal communication;
- using wrong words or words that the user does not understand;
- offering an “either or” choice when the solution lies somewhere in between;
- failing to understand that the user has a different perspective from that of the designer, often caused by unfamiliarity with the system;
- inability to establish the links between the objectives and the job;
- inability to stimulate thinking by various presentation to the user and his/her team as well; and
- providing unhelpful documentation.

This last drawback also gets reflected in the training they provide to the users. This will be discussed in the next section.

### Self Check Exercise

- 5) State the reasons for which information professionals play their role ineffectively and inefficiently.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 16.6 ROLE OF DATABASE DESIGNERS AND MANAGERS IN TRAINING USERS

Training on the developing application system for users must begin as early as possible. It has been found that the longer the period of time end users are indoctrinated to new system change, the less resistance they exhibit toward these changes. This process may lead to early discovery of system faults. The team members including system designers and managers need to interact among themselves, during the developmental and prototyping stages in deciding the specifications and program development. Once the system is developed and implemented, it should be operationalised. They lead to the documentation of operational information and training of users in operating the system. The documentation part has already been discussed in the previous sections.

### Training Logistics

**Who is the training audience?** Prospective end users are the foremost audience. Managers and executives require at least an overview of the new system whereas, information oriented professionals should be trained on how to use and operation oriented professionals should be trained on how to operate the new system.

**Who should conduct training?** Training should be conducted by the professional trainers including specialists of hardware and software.

**Where should training be conducted?** Three choices are (1) on-site training at the work site of the end user. (2) on-site training at the separate location (3) off-site training.

**When should training be conducted?** Training should be initiated during the developmental process and also after the completion of the project. Comprehensive training should be provided after the final implementation of the new system. At the same time refresher training should be conducted as close to new system operation as possible to prevent forgetting.

**How much and what type of training should be conducted?** Depending upon the demands of the persons seeking training, the duration of the training need to be decided.

### Types of Information

Two types of information documented as output of the exercise are:

- 1) System development and maintenance information
- 2) System operation information.

#### 1) System Development and Maintenance Information

All the activities involved in the database design and the associated management system development life cycle, namely, feasibility study, analysis, design, programming and implementation are all documented in detail to enable the users to understand clearly the structure of the systems in terms of architectures, modules of programs, etc. and they are very useful in motivating the system use. This will further enable the transfer of responsibility for activities pertinent to routine runs, such as, data capture and validation, computer operation, output distribution, job set up and supplies procurement. Maintenance of system in terms of hardware and software is the vital activity that ensures smooth functioning of the system. This information again requires proper documentation. For example, program maintenance is not just limited to correction of errors but includes their modification. If it can be modified by the user then proper supporting documentation is required.



## 2) System Operation Information

As explained in the earlier section operation information may be anything starting from booting the DBMS to enhancing programs, etc. But, usually, it is about initiation of the system and designating input and output for the module being used. This information would be well documented with a guide index to ensure its understanding and use at every stage. This also has implications for system design - for example: simple changes like blinking cursors at the input point may direct the user easily for entering the input data. This information will be used in training the end users for handling the system. Operating instructions may be prepared for the use of the end users to operate the new system. Operating instructions may include:

**Purposes:** Operating instructions may be used to train new users, reacquaint experienced users who have not used the system for a while and provide guidance on how to handle uncommon system occurrences.

**Types:** There may be three sets of operating instructions to prepare.

- i) User interactions;
- ii) Technical instructions; and
- iii) Executive overviews.

**Operating instruction guidelines:** Following may be some points are to be considered during preparation of operating instructions:

- Prefer on-line documentation as an alternative to off-line documentation.
- Instructions may be previewed by the intended audience.
- Instructions should be professionally prepared and aesthetically pleasing in order to inspire user confidence in the authenticity of the instructions.
- Organise the instructions in modules.
- Include an index of common problems that may be encountered and how to solve these problems.

In the context of the library, two types of users should be kept in mind: (1) the operators and the professionals, and (2) the library clientele who also use the system as laymen until they get acquainted with its operations.

These two user groups being the primary groups, the system should be most user friendly, so that even the least knowledgeable person will be able to handle the system. This is a very important feature the system designers should keep in mind. They should tailor the system to address this need effectively. This is in turn reflected in the need for very little training to both library staff and its users.

This can be looked at from another point of view. Requesting the users to participate during prototyping will help in obtaining feedback. This will enable the modification of the database system to suit their needs, and will reduce a lot of burden on training. Effective training can be operationalised at three levels:

- i) Training executives;
- ii) Training middle level management; and
- iii) Training users.



Their training can be conducted through seminars, short seminars computer assisted instructions, etc. The training programme can be organised for teaching data processing concepts. Difficulties in advanced use, explanation of the assumption behind the models used can be overcome by programmes like:

Quick starts — that is an introduction to initiating the system and use.

Refresher aids — refreshing programmes for an update system.

### Self Check Exercise

6) On which levels can the training of users be organised ?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 16.7 SUMMARY

In this Unit, the following topics have been covered:

- The definition of information systems, databases, structure of information system and various categories of information systems.
- The different phases of design and development of database systems, role of consultants in designing of information systems and the importance of consultants in selection, installation, implementation and operation of the information systems. The role of database designers and managers in training users have also been discussed in brief.
- Information systems professionals and their essential and desirable skills for the operation and functioning of information systems.

## 16.8 ANSWERS TO SELF CHECK EXERCISES

- 1) An information system is a collection of people, procedures and equipment designed, built, operated and maintained to collect, record, process, store, retrieve and display information.
- 2) A Database Management System is a software package that is used to define, store, maintain and provide controlled access to databases. Some of the DBMS are:
  - Relational Database Management System (RDBMS) (Examples: Oracle, Access, FoxPro, SQL Server, Infomix);
  - Object Oriented Database Management System (OODBMS) (Jasmine, GemStone, O2, Object Store, Versant ODBMS); and
  - Object Relational Database Management System (ORDBMS) (DB2, Dynamic Server).

- 3) The following are four phases of database system design and development:
  - Definition phase
  - Construction phase
  - Implementation phase
  - Operational phase
- 4) There are broadly five categories of professionals involved in the design and development of information systems:
  - Operation-Oriented Professionals.
  - System-Oriented Professionals.
  - Technology-Oriented Professionals.
  - Management – Oriented Professionals.
  - Information – Oriented Professionals.
- 5) The following are the reasons for which information professionals play their role ineffectively and inefficiently:
  - making wrong assumptions about the needs of the users,
  - not giving people the feedback of the work in progress,
  - failure to overcome psychological barriers between the users and themselves,
  - inability to communicate with users,
  - overestimating or underestimating the requirements,
  - poor non-verbal communication,
  - using wrong words,
  - offering an 'either or' choice when the solution lies somewhere else,
  - failing to understand that the user has a different perspective from that of the designer,
  - inability to establish links between the objectives and the job,
  - inability to stimulate thinking by varied presentation to the user, and his team members, and
  - providing unhelpful documentation.
- 6) Training can be organised at three levels. They are :
  - 1) Training Executives
  - 2) Training Middle Level Management
  - 3) Training Users

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## 16.9 KEYWORDS

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- Benchmarking** : The process of calibrating efficiency against other systems, getting the inspiration and building on others experiences.
- Data** : Data is defined as facts and figures that can be used as a basis for reasoning, discussion, or calculation. It is collected from observations and experiments. It is refined to make it meaningful.



- Database** : A database is a collection of related data and metadata stored in secondary storage. Data in a database are persistent because once data are stored in the database, it can be retrieved, updated, or removed from the database only by an explicit request to the Database Management System.
- Database Management System (DBMS)** : A Database Management System is a software package that is used to define, store, maintain and provide controlled access to databases.
- Data Recovery** : The process restores the database to a correct state after a failure. It protects the database from inconsistencies and data loss.
- Documentation** : The dictionary meaning is “furnishing relevant documents to substantiate a claim”. The definition in LIS field is collecting organising, recording, disseminating, etc. of micro- documents.
- Log File** : A special file maintained by a Database Management System contains information about all updates to a database.
- Metadata** : Metadata describes how data are stored in the database. It includes storage structures, logical database structures, and user views or subsets of conceptual schema.
- Object-Oriented Database** : It is based on object oriented data model defined by Kim in 1991. In this Management System (OODBMS) database is developed in the form of persistent and sharable objects supporting object oriented principles. Examples of OODBMS are Jasmine, GemStone, O2, Object Store, Versant ODBMS, etc.
- Object-Relational Database Management System (ORDBMS)** : It is a hybrid of the RDBMS and OODBMS which allows users to take advantage of OODBMS and to maintain consistent data structure in an existing relational database. Examples of ORDBMS are DB2, Dynamic Server, Oracle 8i, etc.
- Relational Database Management System (RDBMS)** : Relational Database Management System is based on the concept of relational data model in which data and relationships are represented in tables that are composed of rows and columns. Each column has a unique name and data type. A data value is stored in at the intersection of each row and column. Examples of RDBMS are Oracle, Access, FoxPro, SQLServer, Infomix, Sybase and Visual Base.
- Systems Analysis** : The analysis of a problem that the organisation will try to solve with the information system.
- Systems Design** : Details how a system will meet the information requirements as determined by the system analyst.

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## UNIT 17 DATABASE INTERMEDIARIES

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### Structure

#### 17.0 Objectives

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#### 17.2 Database Intermediary

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##### 17.2.2 Personal Traits

##### 17.2.3 Functions

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##### 17.6.3 Training End Users

#### 17.7 Summary

#### 17.8 Answers to Self Check Exercises

#### 17.9 Keywords

#### 17.10 References and Further Reading

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### 17.0 OBJECTIVES

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After reading this Unit, you will be able to:

- define database intermediaries and their role in libraries/information centers;
- list the attributes of a good searcher;
- highlight the stages of search;
- identify the roles of database intermediaries and know the functions of each one;
- distinguish the role of an end user;
- recognise the future of database intermediary; and
- reckon database intermediaries of potential sources of information.

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## 17.1 INTRODUCTION

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The Unit introduces you to database intermediaries who help users to search databases including web enabled databases. The Unit also discusses the importance of database intermediaries in present day libraries and information centers for retrieval of information.

A search process in an information retrieval system environment may be delegated or non-delegated. In delegated search the information intermediary performs the job of searching in favour of the user, while in the non-delegated mode the user himself/herself conducts the search. It has been often noted that in most of the cases, users face difficulties in representing the actual query in the language of the system. It has also been noted that users very often wish to represent their queries in a natural language.

The users need to get some training to get acquainted with a suitable way of representing a query to the system. In order to avoid this constraint, researchers have attempted to develop what is known as front-ends or gateways, or interfaces which not only accept natural language queries from the users and convert them into machine/system acceptable form but also guide the users in formulating their queries.

Information flows around us all the time. Whether within organisational databases, within on line databases, or on computer networks, data are constantly being transmitted from one place to another. Much of the time, such data flows directly between the information producers and information consumers. Sometimes, however, intermediaries stand in the way of simple data flow; for example, to monitor data flow or bridge between database source and user query. Intermediaries can thus, turn ordinary/raw information into value-added information.

We are aware that information retrieval from databases provides access to a broad range of information at a low cost. Libraries/information centres all over the world are finding such services/system as an everyday necessity. For the past so many years several major database vendors provide ready access to hundreds of databases containing a wide range of materials. The records of databases contain usually references to journal articles, books, technical reports, patents, conference proceedings, standards, dissertations, etc. These databases cover many areas of recorded knowledge and carry useful data/information from them.

Here the database producers will make available databases including computer access to the information contained in the databases. The search service vendors are organisations that own computers and softwares for information retrieval. They have also developed commands and a set of instructions for searching information from databases, and the connections to search databases are through telecommunication links. The final role here is that of the database intermediary who utilises all the other components simultaneously. As the use of online databases requires considerable amount of training, searching on behalf of the users is usually carried out by an information specialist or a librarian, referred to as an intermediary with special skills. The intermediary usually accesses the information from databases through a computer terminal located in the library/information center.

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## 17.2 DATABASE INTERMEDIARY

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The concept of intermediary is not a new one. In fact, intermediaries are so commonplace that it is difficult sometimes to even notice them. For instance, human intermediaries are seen in everyday life for assisting people to carry out various activities with ease. The basic task of an intermediary is to translate customer



request in a manner that facilitates easy access to any commodity to users. And when anyone tries to find information for users from databases, the person is called a database intermediary.

A database is replete with answers yet sits powerless and mute until an appropriately phrased query is posed. It is the role of an intermediary to translate a user's request/information need into a question/query, which a database is capable of answering/providing. Database searching presently is a service of major importance performed in libraries and information centers. In all cases where searches are carried out, the vital components being selection of databases, a user's inquiry and a searcher. The interaction of all three may well determine the success of a project report, a research paper, a presentation or anything else for which information is sought. The intermediary is thus a vital link between the user and the database. It is the intermediary who will carry out retrospective search or look for up-to-the minute information on a particular topic. The end users often lack computer knowledge, database knowledge and are not aware how to formulate their queries. The library intermediaries help the users in carrying out the search of the databases. The intermediaries are information specialists or librarians, whose role is to identify the needs of end users and search for relevant information from appropriate databases on behalf of the users.

### 17.2.1 Definition

A database intermediary can be defined as an information specialist skilled at searching databases and satisfying the end user's requirements. The intermediary should have knowledge and experience of hardware, software and communication technology, database search both generally and relating to specific files, transmission and use of information. Intermediaries also need skills in interviewing and communicating with end users and practical experience is most important. Intermediaries and end users must be aware that information cannot be retrieved from a database if it is not inputted properly.

Intermediaries are of great help as they:

- help users to get access to existing database information;
- influence supply by forwarding information needs of users and their demands for information to database managers; and
- provide external end users who do not get a chance to use databases as they may lack technical accessibility.

As already mentioned, it is the role of the intermediary to translate a user's information need into a query which a database is capable of answering. As the word translation indicates, this process requires a working familiarity with two languages – that of the user and that of the database. Besides this, also required is a substantial intellectual ability for screening and processing the request/information need viz., a shifting for meaning, a juggling of concepts and a prioritisation of possible and probable approaches.

### Database Administrator

A database intermediary is different from a database administrator as a database administrator (DBA) is an information technology expert or a well-trained, computer literate person who is responsible for the technical operations of all databases in an organisation. The duties of the database administrator include management tasks, security tasks, planning tasks and day-to-day activities related to management and administration of databases both in-house and others required for an organisation.



On the other hand, a database intermediary is a mediator whose chief task is to match the right information with the person's information needs from any database.

### **Historical Background**

When information retrieval from databases was first introduced in libraries/information centers, professionals trained to use them were librarians and information professionals. Some of these database intermediaries were selected because of their familiarity with computers and some were selected due to their extensive knowledge of the subject of the database. Since then, the situation has greatly improved, as many professional have now become available and their skills and contributions in searching database have also been recognised. Besides, it has also been realised that for providing services from databases, professionals with some special skills are required to search databases in addition to those required by information retrievers or database administrators.

#### **17.2.2 Personal Traits**

Database administrators often have several different databases under their control while searching. Also being the interface between the end user and the bibliographic database, besides being key to a high quality product being retrieved from the database, the intermediary should possess certain traits, which are different from those of a typical library/information professional. The intermediary should be at ease with computer systems and related technology and also have a flair for carrying out searches. An effective intermediary should have:

##### **i) Organisational and Prioritisation Abilities**

An intermediary should find the job challenging, interesting and have a high sense of dedication to the job. He/She should have proof of organisational abilities and also have confidence to establish priorities.

##### **ii) Attention to Details**

As data searching requires knowledge of highly detailed information, database intermediaries should have good memory and a knack for attending to all details including those specified and not specified by the end users.

##### **iii) Good Concentration**

Intermediaries should have ability to concentrate for long hours while searching as they cannot afford to miss out on any vital detail while searching.

##### **iv) A Logical Mind**

The ability to think in a logical and analytical manner is an absolute must of an intermediary. An effective intermediary should be skilled at problem solving and decision-making.

##### **v) Technological Awareness**

The database intermediaries should have knowledge of technical details of databases, communication networks, cost characteristics of various databases, specific information search hints about databases and differences and similarities in databases.

##### **vi) Capability to Understand User Psychology**

A vital trait every intermediary is expected to possess is the capability to understand user psychology as it helps in determining user needs and leads to user satisfaction. It is also helpful for establishing user categories/levels.



**vii) Communication Skills**

Problem solving capability, skills in communication and interpersonal relations are essential for successful question negotiation with the end users and for promotion and marketing of the database providing the service. The end users should be made to develop confidence that the intermediary understands their information needs, their level of knowledge and background. An intermediary should thus be capable of diagnostic, interviewing and counselling skills.

**viii) Knowledge of Subject Area**

Knowledge of subject areas in which the bulk of the searching is to be done, will aid the database intermediary in becoming effective and faster. The subject background along with information handling skills helps the intermediary to scan and extract essential details from databases.

**ix) Information Retrieval Skills**

As searching databases is based on queries obtained from users, a database intermediary should be able to represent and organise information intellectually, specify a search intellectually and use appropriate processes and techniques to retrieve only relevant information as specified by an end user.

**x) Efficiency**

Orderly work habits, good concentration, attention to details and efficiency helps database intermediaries to become more competent. For cost-effective and timely search operations proper planning is necessary to execute search formulations.

**xi) Perseverance and Patience**

Database intermediaries should have perseverance and be willing to try as many search formulations as the query demands in order to obtain the desired information. Some queries require a great deal of trial and error searching of databases to refine the formulation. They should have patience and the ability to adopt whenever adverse conditions exist due to computer problems, interruptions and heavy workloads. The intermediary should be patient to work through repetitive tasks and be able to judge when to pursue a search further and when it is best to quit.

**xii) Shares Knowledge**

As the database search services are integrated with other services of information organisation, the database intermediaries should keep other professionals notified and make them aware of the capabilities or limitations of database services and alert them to any other new databases to utilise the search service to its full potential.

**xiii) Willingness to Learn**

Database intermediaries must learn a great deal about all aspects of handling databases on their own; infact much more is required than formal training to search databases. They should learn about different databases, how each one is indexed by suppliers and how each database is loaded. All tools like search guides, thesauri, newsletters and search system manuals should be constantly studied, knowledge of these are updated and replenished.

**17.2.3 Functions**

The database intermediaries often have several databases under their control. They often perform several functions in an information centre, which are:

- Liaising with database users to establish their needs,
- Selecting databases,
- Liaising with database content vendors and database software vendors,
- Procuring and maintaining database software and related documents and tools,
- Monitoring the databases and optimising database performance,
- Installing database softwares,
- Explain search system to all concerned,
- Subject analysis, preparation of key terms, synonyms, etc.,
- Selection of possible search (key) terms,
- Analyse abstracting and indexing journals and thesauri to prepare for search,
- Carry out search on behalf of the end users,
- Demonstrate search strategy and search system to users to carry out search,
- Locate related references in the library/information center ,
- Monitoring and managing database backups including restoration,
- Maintaining database security, software licenses and content licenses,
- Suggest additional ways to follow-up search, and
- Edit and format the search.

**Self Check Exercises**

- 1) Explain how database intermediaries are of great help to the end users.
- 2) List any five qualities of an intermediary.
- 3) State some functions of the intermediary in an information centre.

**Note:** i) Write your answers in the space given below.  
ii) Check your answers with the answers given at the end of the Unit.

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**17.3 STAGES OF SEARCH**

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As discussed above, it is the intermediary who will carry out the search or look for up-to-date, the minute information on a particular topic on behalf of end users. Searching information from databases is a very difficult task. The process of preparing and conducting a search is a rather complex activity that involves the formulation of an information query into a clearly articulated, searchable problem statement; and the



detection and correction of searching the generation of a search strategy for finding citations or full-text items relevant to the information requirements of end users; and the detection and correction of searching errors.

The process of information search involves the following steps:

- Pre-search counselling.
- Preparing for the search.
- Search strategy.
- Conducting the search.
- Follow-up.

Given below are the details of the stages involved in carrying out a search:

### 17.3.1 Pre-search Counselling

The starting point of any search is very vital from the point of view of the end user. The presearch counselling or interview is defined as the process by which an intermediary acting in a purely advisory role gets assistance from the user for devising a user's search strategy for searching information on behalf of the user. This stage helps the database intermediary to clarify and define a search strategy, at times using a presearch counselling search form, explaining search process, suggesting search aids, search term and appropriate databases.

This interview with the end user is very crucial as often the user may not be present at the time of search proper to provide expert/pinpointed subject assistance. This helps the intermediary to be absolutely certain of the information requested by the user. It also requires that the intermediary be somewhat knowledgeable of the subject fields involved. The exchange that transpires between the user requesting for information and the intermediary should be extremely efficient.

Each research interview should usually cover the following:

- Understand the query,
- Discuss the subject matter in detail with the user,
- Detail the scope of the query or information request,
- Discuss the type of database for a particular type of query,
- Describe the appropriate database,
- Develop the search strategy,
- Costs related to the search,
- Describe software features and their usage,
- Discuss the use and benefits of database searching, and
- Perform a final check.

### 17.3.2 Preparing for the Search

Once the presearch counselling is completed, it is usually necessary to perform several other tasks before going for actual search. In case the user is going to be present during the search, the database intermediary should complete all related tasks for the search beforehand. These include:

- Preparation of a schedule for the search,
- Determining which databases are to be searched,
- Using subject vocabulary aids available for the particular database,
- Make ready final choice of search terms, and
- Finalise the search strategy.

### 17.3.3 Search Strategy

We all know that no database can accept a query or question in the way it is normally asked, and interpret it well enough to provide a proper answer. The searcher must translate the search request in a standardised format upon which databases usually operate. This format is referred to as a search strategy or search statement or search profile or just profile.

The search strategy accomplishes two objectives, namely, it states the concepts in the information request, and secondly, shows the relationship – associative or hierarchical between those concepts.

The search strategy thus translates the information needs of the user into a language which a database can understand. Here the most successful database intermediary is the one who can look at a complex search request in more than one way and come up with two or more search strategies. This approach is useful when the first search strategy does not achieve the desired results. The database intermediary must be willing and able to modify the search strategy and keep trying, as long as fruitful results seem likely.

Another important aspect of showing relationships between concepts is by using Boolean Logic which has been covered in another course.

### 17.3.4 Conducting the Search

Once the search strategy is prepared taking into consideration the unique characteristics of the database(s) to be searched, the next activity is carrying out the search proper. The database search usually consists of the following steps once the search strategy is formulated:

- 1) Logging on;
- 2) Executing the search;
- 3) Downloading the relevant items; and
- 4) Logging off.

#### 1) Logging on

The initial step of search involves making appropriate connections from the computer terminal to the appropriate computer. The connection is made using a telephone line and telecommunication network. Here passwords are used known only to the database intermediary for reasons of security. The passwords also ensure that the charges for the search are billed properly.

#### 2) Executing the Search

Once the terminal is connected to the desired database, the next step is to select the appropriate subject terms/headings to be searched. The database intermediary then conducts the search using the already prepared search strategy. The results of the



search, that is, the retrieved items/information can be seen on the monitor of the computer system.

### 3) Downloading the Relevant Items

When sufficient amount of information is retrieved, it is checked on the monitor of the computer for relevance and user satisfaction. The retrieved information is ready to be printed online or a command can be given to print offline and mail the same.

### 4) Logging off

After the search is complete, it has to be ended with a log off command. If more databases are to be searched, a database request command should be given again.

## 17.3.5 Follow-up

The last stage of the search is follow-up after the search is complete. In this stage, the search performance is analysed and the user satisfaction too is evaluated. The criteria for analysis of search performance include database coverage, search failures, subject vocabulary and subject coverage.

User evaluation is usually measured formally or informally. Formally it is usually measured by getting a search evaluation form filled up by the users after the search and informally feedback from user is received by direct communication.

### Self Check Exercises

- 4) Write down the stages of the search.
- 5) State the objectives accomplished by the search strategy.

**Note:** i) Write your answers in the space given below.

- ii) Check your answers with the answers given at the end of the Unit.

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## 17.4 ROLE OF INTERMEDIARIES

As discussed in the previous sections, an intermediary is the chief link in providing information to end users from the databases. Since the use of databases requires a considerable amount of experience for searching relevant information, information centers employ specially trained information professionals for the same. These information specialists as already mentioned are referred to as database intermediaries. These intermediaries play two major roles, that is, of searchers and editors.

Let us discuss these roles of the database intermediary in detail.

### 17.4.1 As a Searcher

The search process begins with an information need or request and ends with completing the search process. A good searcher should possess a variety of skills related to database searching. These include:

- General principles of searching which include concepts of information retrieval, gathering information from the user, problem analysis, planning search strategies and evaluation of searches;

- Academic skills which include knowledge of subject area; knowledge of structure and content of database, and those of computer terminal and telecommunication networks; and
- System dependent skills including connecting to system and disconnecting, the use of commands, entry formats for search terms, implementation of logical term relationship on the system and database implementation.

An ideal searcher thus should not only have technical skills but human communication skills as well. The skills required by a database intermediary compliment each other, neither is sufficient alone.

The activities carried out by a database searcher are in the following sequence after the search strategy is finalised.

The search turns on the computer terminal, makes a connection to the telecommunication network and requests for the appropriate databases. Then he/she keys in the search strategy on the computer terminal and sends it to the host computer containing the database which responds to the results of the search. The results may be printed online from the terminal by a printer attached to the searcher's computer or offline at the search computer site. The searcher also has the option of making changes in search strategy or in the choice of databases and of performing additional searches. The above process continues till satisfactory results are obtained.

Lastly, when the search is completed, the searcher keys a command to exit from the system. The role of the searcher is thus to complete the whole searching process.

#### **17.4.2 As Editors**

The role of the database intermediary as an editor begins after the searcher finishes the database search. Many users are not satisfied if the printout taken from a search or the information collected from the search in raw form. As information professional, we must present the information in analysed and consolidated format as neatness too counts. Besides this, no user is interested in details like passwords, user logins, logoffs, details of search strategy, etc. Although many of these details, unnecessary from users' point of view are not provided in the final material presented to the user after a search, the need still exists for a refined in-house preparation of the search to the requester.

For the users requiring full-text of documents or quick reference searches, the original search printout can be acceptable, but for the bibliographical searching a properly edited and formatted copy should be presented to the users. The role of the database intermediary as an editor includes:

##### **i) Formatting the Search**

The search is usually formatted on blank forms as it helps to identify the source of a document. It also identifies a type or series of search if so desired, such as patent or product safety searches indicate who requested the search, or a provision for a unique search number for future retrieval and the search date.

This activity also personalises the search. Formatting the search usually takes about half an hour of editing time, the editing time may vary according to the complexity of the search.

##### **ii) Database Listing and Summary**

The format should also contain a summary, listing the databases used in the search in the same order in which they were searched. Here, it is vital to include the database



name, source and scan periods covered, especially needed if the search is to be updated in the future.

In order to differentiate the databases within the search itself, it is a good idea to show each database in bold letters.

### iii) **Search Strategy Summary**

The search strategy and postings should be summarised for each database to show the user the various terms and logic that was used for the search and the results therein. Even if the citations are printed as in the off-line printout, the search strategy should be included in the format.

### iv) **References/Citations**

Depending on the immediate need, the connect hour cost and the time required for offline printing, the searcher may wish to limit the number of online references/citations to a preselected minimum for each database and order the remainder offline. Whether a searcher decides to edit the citations or print as they appear, will be strictly up to him/her.

### v) **End of Search**

The last line of the formatting is the end-of-search line and the addition of a statement showing the searcher's name, estimated cost, abstract availability, document availability and/or delivery and whatever standard notice the searcher may wish to bring to the user's attention. Another desirable feature is the ability to omit the online cost throughout the search and to present it as one estimated total cost.

### **Self Check Exercises**

- 6) What is the role played by an information specialist as a database intermediary?
- 7) State the skills performed by a database searcher.
- 8) Enumerate the role of a database editor.

**Note:** i) Write your answers in the space given below.  
ii) Check your answers with the answers given at the end of the Unit.

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## **17.5 ROLE OF END USERS**

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In many database searches, various attempts have been made to bring the end users to search the databases directly. Of late, it has been felt by many information specialists that in order to specify a search intellectually, a discourse between users and intermediaries (humans) leads to effective information retrieval. This requires that search procedures should be simplified or user friendly. Although various approaches can be taken to provide easier and friendlier user-system communication, the prevailing approach is to develop interfaces or systems using intermediaries.

### 17.5.1 Database Intermediaries vs End Users

It has been seen in many information centres or libraries that the users, for locating relevant information, usually prefer the database intermediaries to search the databases instead of having facility of directly searching the databases. Some of the reasons why end users prefer database intermediaries carrying out the search on their behalf are:

- Fear of using the computers and computer systems for lack of knowledge or appreciation of what is involved. Many users especially those working in senior positions are reluctant to use electronic equipment.
- Users often lack familiarity with databases and also have an inability to grasp command language, passwords and activities related to log on and log off.
- Lack of time due to job pressures. Besides this, some users if overloaded with work and information are likely to miss out vital information/sources/references.
- A feeling that search would be more efficient if undertaken by an intermediary.
- At times users have the notion that if they search directly, the costs may be heavy.
- Users cannot define their own information needs due to lack of knowledge of search strategy.

From the above it can be deduced that the intermediaries are essential for a large number of end users, as many end users may have information needs, but are unable to define the same and thus are unable to interact directly with the database. The intermediaries, therefore, not only define the information needs but also direct the search in such a manner that results in efficient information retrieval, which is cost-effective.

As both, the end user being subject expert and the intermediary having knowledge of the databases containing information and intricacies of searching them, are active participants in the whole of search process. Besides, this, the user, although has the option of carrying out the search directly, may still opt for an intermediary. In some cases, the user can learn or be taught to do database searching by themselves. However, the cost in terms of training time and the follow-up may be rather high.

The best way, therefore, is for both to work jointly as the end user possesses the subject expertise and the intermediary is well versed with information handling skills. They will together be able to perform better searches if each remains in his/her role.

#### Self Check Exercise

9) Why do end users prefer intermediaries for searching the database?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 17.6 FUTURE OF DATABASE INTERMEDIARIES

While database searches are delegated to intermediaries, various attempts have been made to bring end users to the terminal. Due to intensive use and awareness of World



Wide Web (WWW) by users at all the levels, it is believed that in the near future, the end users may perform their own searches as the search procedures are becoming simpler and more user friendly. Although various approaches can be taken to provide easier and friendlier user-system communication, the prevailing approach is to develop interface or intermediary system.

### 17.6.1 Interface

With an intermediary system, users are free from encountering peculiarities of databases and search systems. Here, users can enter a request in a loosely structured format, preferably in a natural language and an intermediary system processes request terms, displays information to users and asks for some sort of feedback. This sort of interaction usually proceeds to a point till the users wish to terminate the session.

These interfaces when actually become operational, are going to be more effective than human intermediaries in cases where queries can be represented properly and search strategies can be formulated properly.

However, relative merits of computer and human intermediary assistance will be evaluated by the users eventually. Users usually prefer human intermediary approach than that of the computer intermediary. Also, in a number of situations human experts can outperform computers. A lot of research in future is required to make computer intermediaries more effective than they are presently, for both users and human experts intermediaries.

### 17.6.2 Web Intermediaries

We are aware that an information stream conveys data from an information provider to an information consumer. In order to improve information retrieval while searching the websites, and to produce a more powerful and flexible web, the concept of *web intermediaries* has been developed. These intermediaries are computational entities that can be positioned anywhere along an information stream and are programmed to tailor, customise, personalise, or otherwise enhance data as they flow along the stream.

We can thus define web intermediaries as computational entities that operate on information as it flows along a stream. Because of the large number and kind of information streams that are now available, there is a new opportunity to take advantage of the intermediary computation. It is believed that intermediaries can add value in several ways. An intermediary, here, can:

- 1) Produce new information by injecting it into the stream;
- 2) Enhance the information that is flowing along a stream; and
- 3) Connect different streams.

It is to be noted here that web intermediaries do not create new information devices but increase the value of existing devices by improving the streams upon which the devices operate. Also, the intermediaries do not create new information streams but enhance existing streams.

When the database is searched by web intermediary or a computer intermediary system, users are free from encountering intricacies involved with databases and search systems. Also the search procedure are simplified and made user friendly.

The web intermediaries are different from database intermediaries as these are computational entities and seldom require human intervention; on the other hand the database intermediaries are information professionals. However with growing use of the WWW, the role of web intermediaries in the future is likely to increase tremendously.

### 17.6.3 Training End Users

Another role the intermediaries will be playing in future to make the users self-sufficient is by training them. This can be done by training the end users to search databases directly. The users can be taught the skills needed to conduct database searches.

The specially conducted training programmes for users should include the following aspects:

- Length of the training programme should be short;
- Administration of passwords;
- Handling costs of searching; and
- Familiarity with often used commands and types of searches.

The future of the database intermediary appears to be quite bright due to the enhanced role of the intermediary as an information consultant. Also, there seems to be a general acceptance that although end users doing their own searches will increase, the information specialist will be still required in a majority of cases. A great majority of users may be subject specialists and can carry on their search themselves, but they do not want to be bothered with tedious jobs which an intermediary has to carry out that include preparing search strategies, preparing for the search, login and logouts, etc.

From the above, it can be concluded that the database intermediaries are in no way threatened by the end users by seeking non-delegated search. Even so data intermediaries services are required for quite some time in the future too.

#### Self Check Exercise

10) What is the advantage of using web intermediaries?

- Note:** i) Write your answer in the space given below.  
ii) Check your answer with the answers given at the end of the Unit.

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## 17.7 SUMMARY

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Database intermediaries can turn ordinary information into value-added information thereby enhancing the quality of available information. It is a known fact that at present no library/information center is capable of acquiring huge amounts of information due to various factors especially the financial constraints. Therefore, information networks have become a necessity as they ensure easy access to information for users by providing various necessary linkages. The major components of an information network are the users, the database producers, search vendors, telecommunication networks and the intermediary who can turn ordinary information streams into value added streams that enhance the quality of available information.

In this Unit, we have learnt that the end user is subject specialist and the intermediary is an information specialist. Database search is performed in a better manner when each



of them works together although maintaining each one's role. When an end user attempts a search, it is usually inefficiently done, and both time and money are wasted. Many times, some relevant documents may be missed because the end user may not know which databases to search and also the user may not be familiar with the complexities of searching a particular database. On the other hand, when an intermediary tries to become the subject specialist, he/she may not be familiar with the technical terminology and many times may not be able to recognise whether or not the item identified by the search are really relevant. Thus, even if a search strategy may be well thought out, still may yield non-relevant items.

Lastly, it has been seen from various studies that the key to a successful search is interaction between user, intermediary and the database. Besides this, as information stream on the World Wide Web is managed by computational systems especially the stream between browser and server, we may find computational intermediaries also referred to as web intermediaries taking over the search functions in the future.

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## 17.8 ANSWERS TO SELF CHECK EXERCISES

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- 1) Intermediaries are of great help to users as they:
  - help users to get access to existing database information;
  - influence supply by forwarding information needs of users and their demands for information to database managers; and
  - external end users do not get a chance to use databases as they may lack technical accessibility.
- 2) Five qualities of an intermediary are: self-confidence, logical mind, technological awareness, and knowledge of the subject area and good communication skills.
- 3) Several functions performed by a database intermediary include:
  - Liaising with database users to establish their needs
  - Selecting databases
  - Liaising with database content vendors and database software vendors
  - Procuring and maintaining database software and related documents and tools
  - Monitoring the databases and optimising database performance
  - Installing database software
  - Explain search system to all concerned
  - Subject analysis, preparation of key terms, synonyms, etc.
  - Selection of possible search (key) terms
  - Analyse abstracting and indexing journals and thesauri to prepare for search
  - Carry out search on behalf of the end users
  - Demonstrate search strategy and search system to users to carry out search
  - Locate related references in the library/information center
  - Monitoring and managing database backups including restoration
  - Maintaining database security, software licenses and content licenses
  - Suggest additional ways to follow-up search
  - Edit and format the search

- 4) The process of information search involves the following steps:
  - i) Presearch counselling
  - ii) Preparing for the search
  - iii) Search strategy
  - iv) Conducting the search
  - v) Follow-up
- 5) The search strategy accomplishes two objectives, namely, it states the concepts in the information request, and secondly, shows the relationship – associative or hierarchical between those concepts.
- 6) The roles played by an information specialist as a database intermediary are that of a searcher and an editor.
- 7) A good searcher should possess a variety of skills related to database searching. These include:
  - General principles of searching which include concepts of information retrieval, gathering information from the user, problem analysis, planning search strategies and evaluation of searches.
  - Academic skills, which include knowledge of subject area; knowledge of structure and content of database, and those of computer terminal and telecommunication networks.
  - System dependent skills including connecting to system and disconnecting, the use of commands, entry formats for search terms, implementation of logical term relationship on the system and database implementation.
- 8) The role of a database editor includes: formatting the search, database listing and summary, search strategy summary, references and termination of the search.
- 9) The end user prefer the intermediary for searching the databases due to various factors that include fear of using computers, laziness, cost, lack of familiarity with the databases and job pressure.
- 10) In order to improve information retrieval while searching the websites, and to produce a more powerful and flexible web, the concept of *web intermediaries* has been developed. These intermediaries are computational entities that can be positioned anywhere along an information stream and are programmed to tailor, customise, personalise, or otherwise enhance data as they flow along the stream.

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## 17.9 KEYWORDS

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**Computational Entity** : It is an artificial entity that exists as software on a computer, in the computational environment. It is an entity, which is not a person, typically implemented using computer software, such a software agent or other form of software or a robot. In knowledge management, a computational entity acts as a database intermediary, thereby, assisting searchers and intermediaries.

**Database** : Organised set of data stored in a computer, which can be searched automatically.



- Database Access** : A continuous period of connection to an online database.
- Database Administrator** : A person responsible for the usage, accuracy, efficiency, security, maintenance, administration and development of an organisation's computerised database(s), providing support to some or all departments depending on the size of the organisation.
- Editor** : One who edits, reformats or transforms searched information in order to make it usable by the end user.
- Intermediary** : An information specialist or librarian who acts as a 'mediator' between users and the database. He/She is an active participant in the process of matching the right information from the database source to the user needs.
- Online Search** : Interactive access by computer to as many machine-readable databases as the searcher considers necessary to conclude the search.
- Producer (Database)** : The creator of the database. These are organisations that collect the information, select appropriate documents and convert the materials into machine readable form.
- Searcher** : The person who actually searches the database.
- User (or Requester)** : The person who will ultimately use the retrieved information.
- Web Intermediary** : An infrastructure for designing and building web-based intermediaries. Elements of web search include users, a web browser, the Internet, the web server and a database. Here Internet and web server are intermediaries or may require web intermediaries for assisting users.

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## UNIT 18 MEDIA PERSONS

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### Structure

- 18.0 Objectives
- 18.1 Introduction
- 18.2 Mass Media
  - 18.2.1 Functions, Scope and Expanding Dimensions
- 18.3 Components of Mass Media
  - 18.3.1 Print Media
  - 18.3.2 Radio Broadcasting
  - 18.3.3 Television
  - 18.3.4 Audio-Visual Media
  - 18.3.5 Motion Films
- 18.4 Advertisements
- 18.5 Public Relations
- 18.6 Information Communication Technologies (ICTs) and Mass Media
- 18.7 Media Persons as Sources of Information
- 18.8 Reference and Referral Tools in Mass Media
- 18.9 Summary
- 18.10 Answers to Self Check Exercises
- 18.11 Keywords
- 18.12 References and Further Reading

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### 18.0 OBJECTIVES

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After reading this Unit, you will be able to:

- comprehend mass media and its components;
- get an insight into the functions and activities of the components of mass media;
- grasp the scope and functions of newspapers, broadcasting, television;
- recognise and identify the professionals involved in mass media;
- appreciate the value of mass media persons as sources of information;
- perceive the impact of ICT on mass media; and
- get acquainted with the reference and referral tools in mass media.

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### 18.1 INTRODUCTION

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In this Block, you have been exposed to six different categories of persons who could be valuable sources of information. In this Unit, let us look at media persons as sources of information.

Mass Media, also known as mass communication is a powerful instrument for shaping public opinion and public policy. They purvey almost every natural phenomenon and



current human events and activity. Persons functioning in mass media are invaluable sources of information. Their knowledge, practical skills and experience never get fully recorded and, therefore, not available for others to make use of and utilise when required. Therefore, they themselves are sources of information, worthy to be taped, for getting information on mass media and related activities.

Library and information professionals are interested in mass media persons not only as invaluable sources of information but for their own activities of marketing information products and services. As information products and services are becoming more and more commercial, we need to apply ideas and expertise, methods and techniques from mass media persons to market and sell our own products and services.

In this Unit, we will try to get some exposure to mass media, its components, their functions, scope, dimensions, etc. We will all also study the functions of major mass media components such as newspapers, broadcasting, television which are inexorably intertwined with Advertisements and Public Relations. The converging computer, communication, multimedia and digital technologies combined with Internet and web have given mass media unlimited scope to for expansion and innovations in presenting a variety of information and transmit them anywhere in the world.

We will try to understand the value of media persons as sources of information, studying their different skills, expertise and experience, which form invaluable sources of information. We will also discuss in what manner they could be used in marketing and selling information products and services.

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## 18.2 MASS MEDIA

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Mass media is virtually a current awareness service informing people about current events and activities of human beings and also about every significant natural phenomenon and such others of public interest. It encompasses almost every conceivable subject and the focus is on a wide audience, irrespective of their background and knowledge. Scholars, laypersons, professionals, scientists, artists, musicians, in fact, every group of persons get something of their interest provided by mass media. Its influence is profound on human life.

Mass media today is regarded as the Fourth Estate that shapes, influences and indirectly governs public affairs in a democratic set-up. Although the media does not have any constitutional authority to control the affairs of a state, it is a powerful instrument for moulding public opinion on any issue of importance in democratic governance and contributes very significantly in arriving at an acceptable public policy.

Media here refer not only to the physical modes of communication through which information is transmitted but also refer to the varied channels such as print as well as the non-print, through which news and information are disseminated to the users.

Mass media comprise predominantly:

- The print media, primarily daily newspapers, popular periodicals and such others;
- Radio Broadcasting;
- Television;
- Audio-visuals, CD, DVD, etc.; and
- Motion Films.

Advertisement and Public Relations have become an integral part of mass media today as they are so intimately connected, without which mass media would not be able to function.

Let us look at the functions, scope and the expanding dimensions of mass media in the next sub-section.

### Self Check Exercises

- 1) How do you consider mass media as a current awareness service?
- 2) What are the components of mass media?

**Note:** i) Write your answers in the space given below.  
ii) Check your answers with the answers given at the end of the Unit.

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### 18.2.1 Functions, Scope and Expanding Dimensions

The functions of mass media are to inform, influence, mould or shape, instruct, entertain and sell information to large audiences. The large audience constitutes children, students, youngsters, adults, old persons, laypersons, scholars, specialists, and professionals, in fact, every conceivable group. All programmes are conceived, designed and developed to be relevant to groups of different categories. Depending upon the nature of the programmes, the functions, as mentioned above, are executed to achieve these objectives.

The subject of the programmes is also very wide as to include everything of interest to the audiences, such as news on current events and activities, art and music, language and literature, science and technology, business and industry, education and training, management, history and geography, travels and tourism, transport and communication, computers and telecommunications and so forth.

In presenting programmes on any of these subjects, the designers and developers, have a variety of physical media to choose from.

All elements of mass media require high-level intellectual inputs. Nonetheless, with the spectacular advances of Information and Communication Technologies (ICTs) combined with multimedia, increased emphasis is bestowed on the physical medium as an important element, as this medium is perceived to be the key component of the effectiveness of transmitting the message. -

In this context, it is appropriate to recall the slogan, '*Medium is the Message*' coined by Marshall McLuhan. This implies that the carrier of the communication, in whatever physical form –human voice, image or text—digitised – influences the message, the sender, the audience and the effects of mass media, far more significantly than it has ever been possible. This is more than true with the advances in multimedia technology.



Today mass media are no more simple physical transmitters of information, but a complex, integrated, intermixed and interactive system that has resulted in the seamless integration of data, text, images and sound within a single digital information environment, enabled by multimedia technology.

The channels that carry information, therefore, are also expanding and increasingly interdisciplinary and interactive with the physical media, providing a new dimension in mass communication.

Yet the quality of information contents which is communicated in terms of reliability, authenticity, user friendly presentation, etc. are of primary importance and will ensure the effectiveness of the message reaching its consumers, despite the best medium chosen.

### Self Check Exercise

3) What are the functions of mass media?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 18.3 COMPONENTS OF MASS MEDIA

We shall now study the major components of mass media with reference to their functions, products, experts and specialists involved, technology used, etc. Despite being tautological, we repeat that the focus of this Unit is to identify mass media persons and highlight on their personal expertise and experience, as worthwhile sources of information. The context in which these experts function, the reference value of their expertise, their accessibility and use and utilisation, etc. are important aspects that are to be explored. However, it is only with a proper understanding and appreciation of the ramifications of mass media, we can identify the media persons and value them as sources of information.

### 18.3.1 Print Media

The main function of the print media, particularly the daily newspapers are to inform, influence, and shape public opinions on every major issue of public importance.

Among the print media that channels mass communication, the daily newspaper occupies the central position. Daily newspapers are published in different editions. Some of the top newspaper agencies publish their dailies from different cities to focus on regional news, events and activities. Sunday editions carry weekly magazines, special advertisements, and other supplements. Everyday the dailies publish one or more supplements on specific topics such as education and training, business and economics,

industry and trade, sports and games, arts and music. Keen competition exists among the newspaper agencies to expand their market.

In India daily newspapers are published in almost all regional languages, some of which have very wide circulation.

Generally the daily newspapers carry news, commentaries and analysis on political/economic/social topics, on current events, personalities, and feature articles on different subjects of public interest, general information on weather, local programmes and activities, business information, share market data and news and many other types of information. Editorials on current specific topics are a daily feature except the Sunday editions, which have a very special value as they may express dispassionate views on important issues of public importance.

Advertisements occupy a major share of space in newspapers. There are daily newspapers that are exclusively on economic and commerce, business and industry, cinema and television, sports and games, and such other subjects of general interest.

The weeklies, fortnightlies and monthlies in English and regional languages have no focus on news, except editorials on specific issues, but have certain additional features that include fiction serials, short stories, poems and verses, film reviews, sports items, religious matter, health care and such others. There are journals/magazines specifically devoted to music, sports and games, religions, films and such other subjects.

In all these periodicals, advertisements form an integral part and carry very large space.

Almost all dailies and other periodicals have their own websites and accessible through Internet. Web advertisements are again a feature of all these.

Except for big newspapers which have their own mechanisms to get news from different parts of the country and the world, in addition to the news supplied by news agencies, most others depend for news from national (Press Trust of India, United News of India, Samachar and international news agencies such as Reuters, Associated Press, etc.).

Like all other mass media, the newspaper bodies are highly structured, well managed but exceedingly complex in its organisation and functioning. The operation of a newspaper is usually divided into three major blocks viz., news and editorials, business and production.

The newspaper industries absorb a good proportion of intellectuals, academics, managers, and technicians. The editorial persons include, reporters, correspondents, research editors at various levels, feature writers, artists and cartoonists and many other professional journalists. The business group comprises managers to deal with all commercial activities and management of the organisation. The production department handles all technical and technological aspects of production. Experts from outside the organisation contribute substantially to render quality to the information carried by newspapers. Advertisements constitute an integral part of newspapers industry today, which sustain them.

Publishers have a role to play in mass media. Bestsellers of certain titles of books have a wide market and readership. Printing and publishing of books on mass scale is an important landmark in literature dissemination and distribution. The introduction of paperbacks affords technical means for fresh image of books as a mass communication cultural media. A sale of million copies of bestsellers is a normal feature today particularly in the western countries.



### Self Check Exercise

5) List the categories of persons involved in Radio Broadcasting.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 18.3.3 Television

Television holds a very dominant position in our lives. It is a young mass medium, growing and developing fast to reach a very high level of sophistication. As it combines visuals and audio, it lures young and old alike. In fact, its influence on the young is so much that sociologists are apprehensive of its bad influence. It performs almost of the functions of a media and does everything to fashion the behaviour of individuals and groups.

Its programmes range from entertainment to highly organised and structured teleconferencing to project world opinion on a number of issues pertaining to political, social and cultural affairs. A great number and variety of persons get involved in the conceiving, planning, designing, execution and production of various television programmes. News, views and commentaries of current events and activities, instructional programmes for students at all levels, educating people on science and technology and their relations to social living, live telecasts of national and international sports and games and other events of general public interest are regularly telecasted.

Special television channels exclusively on sports and games, wildlife, round the clock news bulletins, films, religious discourses and festivals, are on the increase. Almost all events of public interest are telecast live to attract viewers and glue everyone to TV. There is also fierce competition among the television agencies.

Advertisements on TV are ubiquitous. No programme is without advertisements. Time-share of advertisements is more than fifty per cent of the programmes. Whether it is a serial, news bulletin, live telecast of sports and games, religious discourses, and live telecast of any event, advertisements gets a lion's share of time. In fact, many programmes are sponsored by trade, business, and industry in promoting their respective wares. Advertisements cannot survive without the media and media cannot sustain without advertisements.

The types of expertise and special knowledge required to produce such captivating programmes can be easily imagined. Programme designers, developers, scriptwriters, technicians and technologists, artists and musicians, photographic artists, camerapersons and many other specialists are involved in the whole process of telecasting.

The basic function of TV is to produce a variety of programmes on carefully selected subjects and topics, of viewers' interest. Such programmes are produced and telecast

by TV agencies through their multi channels. Programme production is the responsibility of networks, stations and programme production companies. Distribution is the critical function of the network, using ground facilities and transmission agencies.

Cable TV is another agency that telecasts customer-oriented programmes that has introduced a new dimension to telecasting. There is stiff competition among these agencies to reach wider viewers.

In India TV agencies are growing fast, competing with each other. Doordarshan, Star TV, Zee TV, and many other in English, Hindi and almost all other regional languages with their specialised channels for different programmes are telecast round the clock.

Media specialists opine that the future of TV rests on the ability of audience to control and use it for their own purposes. It is said that TV is in the market place and is being reshaped by a variety of technological and social forces.

### Self Check Exercise

6) What are the types of persons involved in TV?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 18.3.4 Audio -Visual Media

Among the many audio-visual media used in mass communication, the videocassettes, CD- Rom and DVD are most influential. They are highly users friendly and closely linked with individual and group use. Many of these audio-visual media are designed with great care and the audio support enhances their value to a very great extent.

CD- ROM and DVD (Digitised Versatile Disc) are extremely valuable for archival purposes. They occupy very little space. An encyclopaedia set can be encoded on a single CD with room to spare.

The production of audio-visual media is a complex and intricate affair. Many types of specialists are necessary to produce a good video either for entertainment, news commentaries or analysis, learning kits and others. Screen scriptwriters, design and development experts, marketing specialists and production experts and a host of others are normally involved in the production of audio-visual items.

The technologies applied are varied and complex. The complexity increases, particularly with the multimedia used for producing audio- visuals. The marketing of these types of media is again a work of high specialisation. Piracy is rampant in this media, besides infringement of intellectual property rights. These are commercial venture of high investment in terms of finance, manpower of quality and production.



### Self Check Exercise

7) Mention the type of persons involved in A/V products.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 18.3.5 Motion Films

Entertainment movie films, documentaries and such others also are important components of mass media. These involve high technology and an array of persons of various categories and intellectuals, actors and actresses with supporting casts, camerapersons, make-up persons, sound experts, lyricists, music setters, orchestra artists, illumination experts, editors, production experts, directors, and a host of other categories of workers of various kinds. Shooting experts in studios with several settings and experts in outside shooting. The financial investments in these types of media are almost astronomical and the market is highly competitive.

## 18.4 ADVERTISEMENTS

Advertising is defined as paid dissemination of information through a variety of mass communication media to motivate a desired action. Advertisements are not free, they are to be paid for. Space is bought in the newspapers and periodicals or the print media; time is bought on radio and TV. Through this payment for space or time, information is disseminated. This is not information for the sake of information but for the purpose of selling or helping to sell commodities and services or gaining acceptance of ideas that may cause people to think or act in a desired manner.

Modern advertising has emerged as the handmaid of industry. It is an outgrowth of mass production, mass market, mass distribution and mass communication. It keeps trade and commerce moving and helps the growth of the economy by creating demand for mass-produced goods and services.

Advertisements are an integral part of mass media, basically for the following three reasons:

- i) They provide substantial financial support for mass media and vice-versa; one cannot survive without the other;
- ii) They are viewed by many as a significant industry, fast developing with dramatic changes and challenges facing practitioners in the field, *vis-à-vis* mass media to expand and innovate; and
- iii) They are a pervasive part of modern culture, a medium for, among other things, the construction of our images as well as of the society; mass media is perhaps, the only avenue to achieve these objectives.

Advertising, publicity, propaganda, marketing are near synonyms with their own shade of difference in meanings. Information disseminated through these methods

may occasionally be get distorted, exaggerated, overemphasised but their objectives are to persuade, influence, motivate and react favourably with regard to buying a product and service.

The messages contained in advertisements are forms of communication that involve creativity, persuasion and impact of the messages. Advertisements carry impersonal messages paid for and controlled by a sponsor. Controlled means that the sponsor, who pays for the advertisements messages, determines their content.

Most of the advertisements are consumer advertisements. But advertisements of trade, business-to-business, corporate houses, are major part of the advertising industry. International advertisements are becoming increasingly important as more or more companies are engaging in global marketing through Internet and web pages.

Advertisements have three major goals;

- i) Advertisers are advertising to help them market their products and services;
- ii) Advertising agencies are specialised companies that plan and execute advertising campaigns for most advertisers. Their work includes creation of advertisements, media planning and research; and
- iii) Advertising media carry advertising to consumers and are dependent on advertising revenue.

Advertisements are conceived, given preliminary shape, altered and finally executed. The entire work is a long process that includes situation analysis, objectives, strategies, tactics and evaluation. The situation analysis includes research, leading to a definition of the advertiser's problem. The objectives of advertisements can range from creating awareness to urging purchase, motivate and influence to accept a product or a service. Strategies and tactics are the actions needed to achieve the objectives. Evaluation is the process of assessing whether or not the campaign achieved its goals.

Advertising agencies choose the media through which advertisements can be featured. Newspapers, periodicals and such other mass media appearing in print, give over 50 per cent of their pages to advertisements. This is particularly so in newspapers those have a large circulation. Entertainment movies, videocassettes, radio and telecasts and all other audio-visual media provide a proportionately long time for advertisements.

It can be discerned that advertisements invariably require a variety of abilities and skills of high quality. Among these, some of the more important ones are: imagination and creativity, ability to grasp consumer psychology, capability to design visuals and write effective short scripts to carry the desired message; choose the right media which would influence or motivate the viewers to buy a product or a service; assess the impact of the advertisements, etc. In the case of audios and videos, duration of advertisements and if they are broadcasted or telecasted, the appropriate time of presentation, etc. are important consideration.

These specialised types of work are nowadays generally entrusted to advertisement agencies although in large corporate sectors, some of these functions are carried out by separate departments wherein specialised persons are employed.

The converging computer, communication and multimedia technologies are the facilitators to get the best advertisements.



### Self Check Exercises

- 8) What is advertisement?
- 9) Why are advertisements considered integral part of mass media?
- 10) State the three goals of advertisements.

**Note:** i) Write your answers in the space given below.  
ii) Check your answers with the answers given at the end of the Unit.

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## 18.5 PUBLIC RELATIONS

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According to the Institute of Public Relations, "Public Relations is the deliberate, planned and sustained effort to establish and maintain mutual understanding between an organisation and its public." To generate understanding, it is necessary for the organisation concerned to understand the public and relate the organisation's activities to public interest.

Today every human activity is invariably organised through institutions. Whether it be business, or industry, state affairs, socio-economics, culture, sports and games, in fact, all activities are organised by institutions. Many of these institutions are massive, such as corporate enterprises, government and similar ones, involve relations with a variety of people at various levels, with different interests, motivations, needs with different economic, educational and cultural backgrounds; and their degrees of relationships varies with ever so many other organisations. These organisations have specific goals to achieve and have to conjure up an image to be successful in their endeavours. It is the Public Relations (PR) professionals that build an image for the organisation and sustain it. In this process public relations personnel will have to maintain the best of relations with the media. These involve media meetings at appropriate time, press releases of various types, preparation of special brochures, programmes for TV and broadcasting, interviews with VIPs, design and production of documentaries and so on.

According to the International Public Relations Association, there are fifteen important areas of PR practices:

- 1) Counselling based on understanding of human behaviour;
- 2) Analysing future trends and predicting their consequences;
- 3) Research into public opinion and attitudes and expectations and advising on necessary action;
- 4) Establishing and maintaining two-way communication based on truth and full information;
- 5) Preventing conflict and misunderstanding;
- 6) Promoting mutual respect and social responsibility;
- 7) Harmonising public and private interests;

- 8) Promoting goodwill with staff, suppliers and customers;
- 9) Improving industrial relations;
- 10) Attracting good personnel and reducing labour turnover;
- 11) Promotion of products or services;
- 12) Maximising profitability;
- 13) Projecting a corporate identity;
- 14) Encouraging an interest in international affairs; and
- 15) Promoting the understanding of democracy.

In all these, and even for more direct PR communication, the audio-visual media have tremendous possibilities today. Radio and TV, particularly with the numerous commercial channels now available, provide opportunities for sponsoring programmes not only for direct image building but also for social marketing. Social marketing, a term used to relate marketing concepts, principles, techniques and skills, to ideas, value systems and social causes – legitimate areas of public relations as experiences of social responsibility of a corporate enterprise.

While advertisements promote marketing of goods and services, PR prepares the ground for such activities. Communication experts and specialists are needed to help and cooperate to communicate facts, opinions to gain attention and select effective modes of communication closely working with users and apply their knowledge and feedback.

Although PR is often associated with business and corporate interest, as pointed out earlier in this section, most areas of our society use PR as a way of maintaining and adjusting relations with various types of public, including local, state and central governments.

The different mechanisms through which public relations experts build up their contact with the public, are through paper-print brochures, pamphlets, graphics materials, audios and videos, radio broadcasts, TV programmes, photographs, stills and moving images, filmstrips, motion pictures and cassette cartridges, floppies and such others. In all these, the use of merging computer, communication and multimedia technologies gives tremendous scope for providing the best kits.

### Self Check Exercises

- 11) Define PR.
- 12) What are the mechanisms through which public relations experts build up their contact with the public?

**Note:** i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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## 18.6 INFORMATION COMMUNICATION TECHNOLOGIES (ICTs) AND MASS MEDIA

Information Communication Technologies (ICTs) and Mass Media grow in tandem. Advances in ICT gives unlimited scope for expansion in mass media in terms of round-the-clock programmes, innovations in design and development of new programmes, worldwide dissemination and transmission, etc. In short, ICT has facilitated a number of developments with far reaching implications for Mass Media. Every component of mass media, the print, broadcasting, TV and audio-visual media uses ICT with great advantage.

The main focus today is on the Internet as a new social sphere, facilitating new forms of economic, political and cultural exchange. It is multi-functional and cross-sectoral. It incorporates World Wide Web and the e-mail. It involves market, government, education, media and every societal sector. It is multimedia in integrating visual, audio and textual material. It enables advances in distant learning, through its new pattern of flexibility, contributing to a reshaping of the knowledge environment and issues of access within it.

Commenting on the future trends, a media specialist observes, “the early twenty first-century *mediascape* is significantly different from 50 years previously. Traditional media have shown resilience in adapting to a changing environment and in utilising new technologies. For mass consumers the result is greater variety and expanding choice in the ways they access information and entertainment. This expansion and varied means of delivery have stimulated demand for content development for new media. A key question about converging, and increasingly interactive, media is whether users will gain access to genuinely novel and more varied forms of content – or whether there will merely be “more of the same.” The pressures of commercialism suggest that innovation and experimentation will be circumscribed by profit-making imperatives.”

Whatever may be the advances in technologies and their application in the contents in new mass media, the expertise and experiences of media persons will continue to be useful and valuable to library and information profession.

### Self Check Exercise

13) What is the focus of Internet in mass media?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 18.7 MEDIA PERSONS AS SOURCES OF INFORMATION

From the foregoing account of mass media and its components, it should be possible for us to appreciate and understand the usefulness of media persons as vital sources of information.

Some of the important factors that govern mass media processes and their primary importance to be considered as potential resource are:



- Mass media operate in a commercial and competitive environment;
- This enjoins quality assurance on the products and services created or generated by mass media;
- Newspapers, periodicals, TV and radio programmes and many other media products of mass media have to operate within a strict time frame;
- This important factor necessitates some of the media persons to tune themselves to write and work at great speed without compromising quality; this is particularly an important factor of great value in terms of assessing their source credibility;
- The time element necessitates the media persons to keep their information ready for use at a very short notice; hence their source of information has to be at their finger tips;
- Media work is team work and every participant in them should fit into the team at the right place, as the output is a common objective; and
- Media persons' expertise, experience and knowledge never get properly recorded and hence, is not available easily. This factor alone is the legitimate reason for tapping media persons as source of information.

We are presenting below a tabular statement of media persons of different categories in relation to the communication components in which they predominantly function and operate. The list enumerated in an alphabetical order of categories, is neither totally exhaustive nor mutually exclusive. Some of the skills and functions may overlap.

Only broad categories of media persons are presented in the table. Each one of these broad categories could have many sub-categories of special skills. For instance among editors, there could be many subgroups such as special editors (news, sports and games, feature articles); editors for different editions of dailies, periodicals and supplements; cadres of editors like chief editor, joint, associate, sub-editors and assistant editors and so on for specific duties and responsibilities, each having a special skill. The type of media persons, skills required, functions to be performed, etc. have been mentioned briefly in the respective sections in this Unit.

**Table 18.1: Categories of Media Persons and the Relative Position in Media Channels**

| No. | Categories of Media Persons     | Media Channels |    |    |    |    |    |    |    |       |    |
|-----|---------------------------------|----------------|----|----|----|----|----|----|----|-------|----|
|     |                                 | Ads            | AC | MF | NA | NP | PP | PR | TV | Video | RB |
| 1   | Artist (Art, Music, Commercial) | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 2   | Ads Specialists                 | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 3   | Camera Person                   | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 4   | Computer HD SF. Graphics        | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 5   | Correspondents                  | ✓              | ✓  | x  | ✓  | ✓  | x  | x  | ✓  | ✓     | ✓  |
| 6   | Directors                       | x              | x  | ✓  | x  | x  | x  | x  | ✓  | x     | ✓  |
| 7   | DTP Specialists                 | ✓              | ✓  | x  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 8   | Editors                         | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 9   | Illumination/Light Experts      | ✓              | x  | ✓  | x  | x  | x  | x  | ✓  | ✓     | ✓  |
| 10  | Managers                        | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 11  | Marketing Specialists           | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 12  | Network Specialists             | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 13  | PROs                            | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 14  | Producers                       | ✓              | ✓  | ✓  | x  | x  | x  | x  | x  | ✓     | ✓  |
| 15  | Reporters                       | ✓              | ✓  | x  | ✓  | ✓  | x  | x  | ✓  | ✓     | ✓  |
| 16  | Researchers                     | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 17  | Photographers                   | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 18  | Programme Specialists           | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 19  | Sound                           | ✓              | ✓  | ✓  | x  | x  | x  | x  | x  | ✓     | ✓  |
| 20  | Studio & Settings               | ✓              | ✓  | ✓  | x  | x  | x  | x  | ✓  | ✓     | ✓  |
| 20  | Subject Specialist              | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |
| 21  | Writers                         | ✓              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | ✓     | ✓  |



|     |                     |
|-----|---------------------|
| Ads | Advertisements      |
| AC  | Audio Cassette      |
| NA  | Newspaper Agencies  |
| MF  | Motion Films        |
| NP  | Newspaper           |
| PP  | Popular Periodicals |
| PR  | Public Relations    |
| TV  | Television          |
| VC  | Video Cassette      |
| RB  | Radio Broadcasting  |

### Self Check Exercise

- 14) In what ways can the library and information professionals possibly use the expertise of the media persons for their products and services?

- Note:** i) Write your answer in the space given below.  
ii) Check your answer with the answers given at the end of the Unit.

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## 18.8 REFERENCE AND REFERRAL TOOLS IN MASS MEDIA

There is an increasing body of literature on mass media that includes a number of reference and referral tools. A few such reference and referral tools listed below would give information on media persons and professionals operating in the different media, although may not be as we desire for our purpose. All the same these tools would be useful in getting a full view of the present-day developments and advances in mass media. This list includes encyclopaedias, handbooks, bibliographies and a few directories of periodicals.

Blum, Eleanor [et al]. (1990). *Mass Media Bibliography, Annotated Guide to Books and Journals for Research and References*. Champaign, Ill. University of Illinois.

Barnow, Erik [et al]. (eds). (1989). *International Encyclopedia of Mass Communication*. New York: OUP. 4 Vols.

Schement, Jorge Reina (ed). (2002). *Encyclopedia of Communication and Information*. New York: Macmillan. 3 Vols.

Sterling, Christopher and Haight, Timothy R. (eds). *The Mass Media Aspen Guide to Communication*. New York: Praeger.

Rivers, William L.[et al]. *The Aspen Handbook on the Media*. New York: Praeger.

Biographical Sources, such as who's who, current biography, etc. throw useful information on eminent mass media persons. Primary, secondary and tertiary periodicals on mass media and communication are listed in Ulrich International Periodicals Directory, The Standard Periodicals Directory and The Indian Periodicals Directory.

These directories are useful to identify titles of periodicals that are relevant to the nature of enquiries. The primary periodicals would help to identify the names of contributors with their institutional affiliations and other details about their positions in the organisations that may indicate their expertise and experience in any special field. The secondary and tertiary periodicals would also identify contributions.

Index to newspapers and current affairs' journals like Asian Recorder, Keessings Contemporary Archives, and Facts on File would also assist in identifying names of media persons, all with their change titles and in the electronic mode and websites.

These general sources may not, in most occasions, serve as the best sources for identifying media persons. For example, if the nature of enquiry relates to identifying a scriptwriter for a video programme, then direct contact will have to be made with video agencies that produce video programmes to get in touch with the expert.

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## 18.9 SUMMARY

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In this Unit, we get a quick exposure to mass media and their components that include predominantly the print media, radio, television, audio-visual products and motion pictures. We study mass media to get a proper understanding of the value of experts involved in mass media programmes and activities, as potential information sources. The knowledge, expertise and vast experiences of mass media persons do not, in general, get fully recorded. As they store their knowledge in themselves, they need to be tapped to use them as sources of information pertaining to mass media and related fields. As mass media deals with every subject of public interest, the media persons may serve as valuable sources in different contexts of information service pertaining a variety of subjects. Their expertise is useful to information professionals to adapt or adopt the knowledge of mass media persons in marketing information products and services.

The components of mass media – Print (that includes daily newspapers, popular periodicals and bestsellers), Radio Broadcasting, Television, Cable TV and Satellites, A/V Products, and Modern films have expanded and grown fast with advances in ICT and multimedia. We give a birds eye view of each one of the components of mass media, their functions, scope and development and to discern the type of experts and professionals working in them. In the expansion and extension of mass media, the impact of the converging ICT and multimedia technologies have been far reaching. Mass media, being the most powerful instrument for shaping and moulding public opinion on any issue, the contents of communication are extremely important to have authenticity, reliability and user friendliness. The technologies provide a wide-ranging choice to communicate messages, design and develop programmes to suit the different target audiences.

Advertising and Public Relations are an integral part of today's mass media. These are discussed in some detail to highlight their role in mass media. The type of persons working in mass media and the channels in which they are associated is summarised in a tabular statement.



## 18.10 ANSWERS TO SELF CHECK EXERCISES

- 1) Current awareness services have been designed and developed to bring to the attention of research persons and others to the current research papers and related ones on any subject. Almost similarly mass media brings to the attention of people at large to current human events activities of their interest.
- 2) The components of mass media are:
  - The print media, primarily daily newspapers, popular periodicals, and such others;
  - Radio Broadcasting;
  - Television;
  - Audio-visuals, CD, DVD, etc.; and
  - Motion Films.
- 3) The functions of mass media are to inform, influence, mould or shape, instruct, entertain and sell information to large audiences.
- 4) The newspaper industries absorb a good proportion of intellectuals, academics, managers, and technicians. The editorial persons include, reporters, correspondents, research editors at various levels, feature writers, artists and cartoonists and many other professional journalists. The business group comprises managers to deal with all commercial activities and management of the organisation. The production department handles all technical and technological aspects of production. Experts from outside the organisation contribute substantially render quality to the information carried by newspapers.
- 5) The personnel in radio broadcasting comprise producers, directors, programme specialists of different categories of activities beside artists, musicians, scriptwriters, journalists and field writers, engineers and technologists, newsreaders and commentators. Invariably it is teamwork and astute team management in terms of producing the best programme is important. Many outside experts and professionals contribute in programme planning, execution and production.
- 6) Programme designers, developers, scriptwriters, technicians and technologist, artists and musicians, photographic artists, camerapersons and many other specialists are involved in the whole process of telecasting.
- 7) The production of audio-visual media is a complex and intricate affair. Many types of specialists are necessary to produce a good video either for entertainment, news commentaries or analysis, learning kits and others. Screen scriptwriters, design and development experts, marketing specialists and production experts and a host of others are normally involved in the production of audio-visual items.
- 8) Advertising is defined as paid dissemination of information through a variety of mass communication media to motivate a desired action. Advertisements are not free; they are to be paid for. Space is bought in the newspapers and periodicals or the print media; time is bought on radio and TV.
- 9) Advertisements are an integral part of mass media, basically for the following three reasons:

- They provide substantial financial support for mass media and vice-versa; one cannot survive without the other;
  - Advertisements are viewed by many as a significant industry, fast developing with dramatic changes and challenges facing practitioners in the field, *vis-à-vis* mass media to expand and innovate; and
  - Advertisements are a pervasive part of modern culture, a medium for, among other things, the construction of our images as well as of the society; mass media is, perhaps, the only avenue to achieve these objectives.
- 10) Advertisements have three major goals;
- Advertisers are advertising to help them market their products and services;
  - Advertising agencies are specialised companies that plan and execute advertising campaigns for most advertisers. Their work includes creation of advertisements, media planning and research; and
  - Advertising media carry advertising to consumers and are dependent on advertising revenue.
- 11) “Public Relations is the deliberate, planned and sustained effort to establish and maintain mutual understanding between an organisation and its public.”
- 12) The different mechanisms through which public relations experts build up their contact with the public, are through paper-print brochures, pamphlets, graphics materials, audios and videos, radio broadcasts, TV programmes, photographs, stills and moving images, filmstrips, motion pictures and cassette cartridges, floppies and such others. In all these, the use of merging computer, communication and multimedia technologies gives tremendous scope for providing the best kits.
- 13) The main focus today is on the Internet as a new social sphere, facilitating new forms of economic, political and cultural exchange. It is multi-functional and cross sectoral. It incorporates World Wide Web and the e-mail. It involves market, government, education, media and every societal sector. It is multimedia in integrating visual, audio and textual material. It enables advances in distant learning, through its new pattern of flexibility, contributing to a reshaping of the knowledge environment and issues of access within it.
- 14) Mass media persons work largely in the information area but with a different focus and purpose. The advertisements that mass media get for their sustenance are usually highly creative, imaginative and ensure success and more or less achieve the target. Information professionals are entering the market for their product and services only in the recent decades, will greatly benefit in the contents of consumer advertisements. Their design and appeal, and presentation with scripts and animation. They may modify these ideas to suit their own market for their products and services. Apart from borrowing ideas, Library and Information professionals can work in tandem with media persons in designing and developing their own advertisements and promotional avenues.

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## 18.11 KEYWORDS

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### Forth Estate

: A group (here the Media) other than the usual constitutional powers, like the legislative, executive and judiciary of a state that wields influence in the politics of a country.



- Mass Communication** : Information communicated to a large audience.
- Mass Media** : Information communicated to a large audience using a variety of ICTs and digital technologies with great effect.
- Media Persons** : Specialists and experts of different categories functioning and operating in mass media communication.
- Multimedia** : Seamless integration of text, image and sound in a digital environment.
- Seamless Integration** : Integration of text, image and sound in a digital information environment without any binding chord fastening each form.

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## 18.12 REFERENCES AND FURTHER READING

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## UNIT 19 INTELLIGENT AGENTS

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### Structure

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### 19.0 OBJECTIVES

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After going through this Unit, you will be able to understand and appreciate:

- what are intelligent agents;
- different nomenclature for intelligent agents;
- characteristics and features of intelligent agents;
- how to test for machine intelligence;
- how do intelligent agents learn;
- different Internet intelligent agents;
- distributed problem solving agents;
- mobile agents that traverse across networks;
- difference between expert systems and intelligent agents; and
- software technology of intelligent agents.



## 19.1 INTRODUCTION

Artificial Intelligence (AI) or machine intelligence has been an area of research for over five decades now. Broadly speaking, the main focus of AI research has been to build computers that are smart like human beings. Many-a-times during this period, it has been said that the effort to build machines with intelligence has been a failure. While it is true that a lot remains to be done in the area of AI, there are certain pockets where AI has made significant progress. Among these are **Expert Systems** and **Intelligent Agents** (IA). Today, intelligent agents play a significant role in a wide range of top industries around the world and on the Internet. In fact, many chief executives of companies have cited the use of IAs as one of the underlying reasons for their companies to reach the top-notch list. Similarly, experts have opined that the future success of Internet and electronic commerce depends heavily on IA technology. Intelligent agents or simply *agents* are known by a variety of names. Some among them are *software agents*, *softbots*, *wizards*, *knowbots* and *software robots*. Within an industry, IAs significantly improved productivity, cut down maintenance cost, help design better products and perform a variety of support functions such as procurement. On the Internet, they manage e-mails, gather information, assist in browsing websites, etc.

## 19.2 WHAT ARE INTELLIGENT AGENTS?

What are intelligent agents? In simplistic and generic terms, intelligent agents are **smart software programs** that provide intelligent inputs to human beings for performing their jobs better. There is no single commonly accepted definition for intelligent agents. There are several definitions, each of which reflects a certain perspective of the agent. We present some example definitions below. Prior to that, it is important to recognise that there are two distinct categories of intelligent agents:

- Industry Intelligent Agents
- Internet Intelligent Agents

The primary objective of industry intelligent agents is to provide intelligent inputs that would go to improve the various business processes such as production, planning, decision support, procurement and marketing. These agents are predominantly run within an industry house, although some of them may access Internet to obtain information. Industry intelligent agents may be stand-alone or distributed across different establishments of the industrial house. The distributed agents collaborate amongst themselves to achieve the common goals of the industrial organisation. We will discuss distributed agents in Section 19.6. A new class of agents, called *mobile agents*, is emerging. We will discuss mobile agents in Section 19.7. Certain agents, such as *interface agents*, are designed to perform specialised functions in limited specific environments. We will discuss such agents in Section 19.8.

Internet intelligent agents have two broad objectives. Both of them are in the nature of alleviating some of the serious problems currently encountered on the Internet. The objectives are:

- To minimise the problem of information overload, and
- To relieve the human beings of the tedious task of navigation and access.

We now present example definitions of intelligent agents. Some of these are generic and some are specific to either industry or Internet agents. The source of the definition is indicated within square brackets at the end of each definition. Some definitions are not quoted *verbatim* but are rephrased to place emphasis on the salient points of the definitions as perceived by this author.



- Intelligent agents are software entities that carry out some set of operations on behalf of a user or another program, with some degree of independence or autonomy and in doing so, employ some knowledge or representation of the user's goals or desires. [IBM].
- An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through effectors. [Russel and Norvig].
- Intelligent agents are computational systems that inhabit some complex dynamic environment, sense and act autonomously or semi-autonomously in this environment and by doing so realise a set of goals or tasks for which they are designed. They are long-lived, proactive and adaptive. [MIT Software Agents Group].
- On the Internet, an intelligent agent is a program that gathers information or performs some other service on regular schedule without the immediate presence of the user. Typically, an agent program, using parameters provided by the user or obtained from user input forms, registration information and query and usage analysis, searches all or some parts of Internet, gathers information that is of interest to the user and presents it to the user daily or other periodic basis. [Whatis.com]

It may be seen from the above that each definition emphasises one or more characteristics of the intelligent agents. The different characteristics that an intelligent agent may possess are summarised in Table 19.1 along with a brief explanation of each of the characteristics.

**Table 19.1: Characteristics and Features of Intelligent Agents**

| Characteristics   | Meaning                                                                                                                                           |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Autonomous        | Capable of acting on its own in a goal-oriented manner.                                                                                           |
| Semi-autonomous   | Act on its own but consult user for decisions.                                                                                                    |
| Proactive         | Take initiative and act anticipating user needs.                                                                                                  |
| Cooperative       | Interact with other agents to obtain services from or provide services to them. Ability to function in a multi-agent environment.                 |
| Collaborative     | Work jointly and closely with other agents to achieve a common goal. Ability to work in a distributed computing environment.                      |
| Independent       | Being able to carry out a task without the constant supervision or guidance of its user.                                                          |
| Learning          | Observe user behaviour, analyse his/her inputs, understand his/her requirements precisely and make predictions about his/her future requirements. |
| Portable          | Capable of functioning across a spectrum of systems and networks.                                                                                 |
| Mobile            | Capable of travelling on its own across networks to other systems and executing itself on the destination system.                                 |
| Decision making   | Ability to take decisions on behalf of the user making use of rule-based algorithms or pattern matching logic.                                    |
| User friendliness | Provide effective, efficient and elegant user interfaces.                                                                                         |



Not all intelligent agents may possess all the features listed in Table 19.1. Since intelligent agents are expected to take initiative on their own and act in anticipation of user requirements, the technology used to build them is sometimes called **push technology**.

#### Self Check Exercise

- 1) Make your own definition of intelligent agents reflecting all the qualities listed in Table 19.1.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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### 19.3 TEST FOR INTELLIGENCE

How do we know that an agent is intelligent? There are so many computer programs that assist the human beings in carrying out their tasks. For example, a word processing package is one such program. Today, a word processor package has a number of powerful features such as spelling check, sentence construction suggestions, auto numbering for lists and grammar checks. Can we consider this package to be intelligent? In simple terms, if the functionality of a software package is carried out by a human being and if the human act can be considered intelligent, then the package is said to be intelligent. In the context of a word processor, a proofreader corrects spelling mistakes. Do we consider this human activity as one that involves intelligence? If the answer is yes, the package is intelligent. Otherwise, the package is said to be a **dumb agent**. Some may consider this particular act of proofreading as involving intelligence and some others as not involving intelligence. Hence, the conclusion regarding the package is somewhat subjective. To contrast, let us consider the example of a human being playing chess with the computer. Here, a human being thinks and acts. The act undoubtedly involves intelligence and, in fact, the human being may even lose games in the play. Clearly, the software is intelligent.

Alan M. Turing, a British pioneer in computer science and AI, has suggested a simple but effective test to determine whether a given computer program is intelligent or not. The test is known by his name as **Turing Test for Machine Intelligence** or simply **Turing Test**. Turing suggested the test during 1950s. Even today, his test is considered the most effective one for determining machine intelligence. Literally, every intelligent agent that is developed is put through this test. The test is based on the evaluation of the agent with comparable human intelligence in an objective way. Although simple and effective, the test is somewhat tedious to perform. It requires at least two sessions before a conclusion can be drawn. Sometimes more than two sessions may be required. The test involves three entities:

- 1) The intelligent agent under test,
- 2) An expert in the area, and

- 3) An experienced user who acts as the tester or the interviewer.

The test configuration is shown in Fig 19.1. The three entities are kept in physically separate rooms. During the first session, the tester is connected to and interacts with either the expert or the agent. Only one of them is made active and the other is not involved in the session. The tester is unaware of who he/she is interacting with. The mode of interaction is such that the tester would get no clue whatsoever as to whom he/she is interacting with. In the second session, the tester interacts with the entity that was not involved in the first session. At the end of the two sessions, the tester may come to one of three conclusions:

- 1) Unable to distinguish between the agent and the expert.
- 2) Correctly identifies whom he/she was interacting with in each session.
- 3) Wrongly identifies whom he/she was interacting with in each session.

If the tester is unable to distinguish between the agent and the expert, it means that the agent is seen as intelligent as the expert. In this case, the agent is declared to be **intelligent**. Second conclusion means that the agent is **dumb**. The third conclusion would require further sessions with another expert.

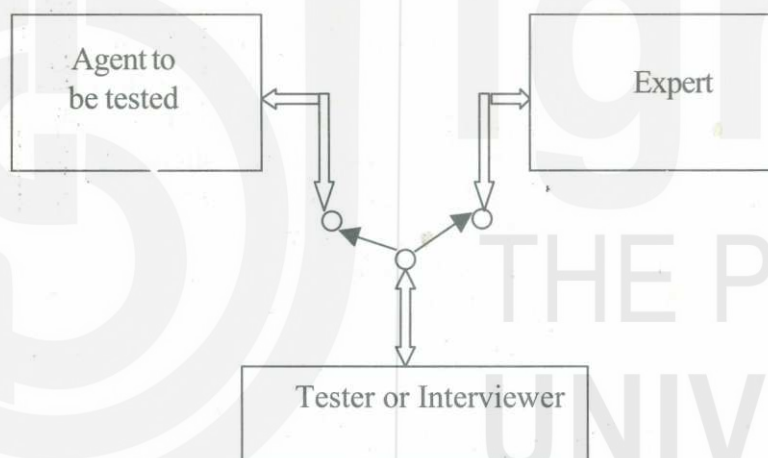


Fig. 19.1: Test Setup for Machine Intelligence

### Self Check Exercise

- 2) Who should act as an expert and who should be the tester for an intelligent agent that has been designed to gather relevant information for a corporate body? Give reasons.

**Note:** i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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## 19.4 LEARNING IN AGENTS

Ability to learn is a fundamental characteristic of intelligent agents. A conventional computer program or a dumb agent always produces the same output for a given set of inputs. But, an intelligent agent learns with time and may take different actions for the same input conditions at different points of time based on its learning experience. Intelligent agents are designed to observe user behaviour and learn to improve their performance with time from such observations. Much as human learning process, machine learning involves five phases:

- i) Situation perception.
- ii) Memorising (Recording).
- iii) Generalisation based on previous knowledge.
- iv) Performing actions based on generalisation.
- v) Refining knowledge based on feedback in terms of success, failure or achievements of certain actions.

A human being encounters a variety of happenings, which we call as *situations*, in his/her day-to-day life. The five senses of the human being feed information about the situations to the brain. The brain evaluates the information and a *perception* of the situation occurs. It is the brain that perceives, and not the senses. The perceived situation is then recorded in the human memory on a short-term or long-term basis. The brain analyses, processes and compares the present situation with previously recorded situations to arrive at generalised conclusion about the present situation. An appropriate action is then taken. The results of actions lead to new situations, which are taken in as feedback by the brain for deciding the future course of action. There is a variety of ways in which a human being learns:

- Rote learning,
- Learning by example,
- Learning by doing,
- Learning from a teacher, and
- Learning by analogy.

Whatever be the method of learning, the five phases of learning discussed above are always followed. In computer terms, rote learning corresponds to recording facts and act exactly as dictated by these facts. This is precisely what the conventional computer programs or dumb agents do. While AI programs have been designed based on the different methods of learning, intelligent agents mostly use learning by example as the main technique of learning. They are designed to observe the user behaviour and perform actions in future as the user had done in the past in similar situations. Learning by example involves constructing a knowledge base that has at least three fields as shown in Fig. 19.2.

| Situation | Action | Confidence level |
|-----------|--------|------------------|
|-----------|--------|------------------|

Fig. 19.2: Simple Knowledge Base of an Intelligent Agent

Situations are rarely identical. An agent records the key features of situations as and when they occur. When the key features largely match with those of any situation

already recorded, the agent performs the same action as had been done by the human being earlier. Concluding that a new situation is similar to the one already encountered is the process of generalisation. If the key features are vastly different from those already encountered, then a new situation record is created. When the human being approves the action taken by the agent, the agent upgrades its confidence level. If the action is disapproved, the agent downgrades the confidence level and also creates a record in a *trap* or *mistakes* database. Whenever a low confidence level is seen in the knowledge database, the *mistakes* database is consulted before an action is taken. This process of keeping track of mistakes and improving performance is considered as *learning by doing*.

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## 19.5 INTERNET AGENTS

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In this section, we discuss the different Internet intelligent agents. There are five main types of Internet agents:

- 1) E-mail agents
- 2) Web browsing agents
- 3) Information agents
- 4) Frequently Asked Questions (FAQ) agents
- 5) Data mining agents

### 19.5.1 E-mail Agents

The primary purpose of e-mail agents is to manage the e-mail of the user. The direct consequence of using e-mail agents is to save the time of user in handling large volume of e-mail. On an average, a factor of four as improvement has been reported by the users of e-mail agents. A user who otherwise spends one hour per day in managing the e-mail ends up spending less than 15 minutes when assisted by an e-mail agent. Based on its knowledge base and the confidence level, an e-mail agent may take one or more of the following actions:

- Forward the mail to the appropriate person,
- Forward the mail and put it on a monitoring list,
- Forward with comments,
- Mark the mail for action,
- Send a simple acknowledgement,
- Send an acknowledgement with committed response time,
- Categorise and prioritise the mail for user attention, and
- Delete junk mail and spams.

### 19.5.2 Web Browsing Agents

Web Browsing (WB) agents are designed to improve the efficiency of search on the Internet. Without the WB agents, Internet searching involves the user and the search engine. User specifies the information requirements by a set of keywords. The search engine searches the Internet websites and produces a list of documents that possibly contain the requested information. While the search engine is busy searching, the user is idle and is waiting. Once the list is displayed, the user selects a document that is most likely to contain the required information for downloading. While the download is in progress, the user is idle. Once the document is downloaded, the



user is busy browsing the document. At this time, the search engine is idling. Thus we have one of two situations: the search engine is busy and the user is idle or vice versa. Web browser agents are primarily designed to avoid these situations and maximise the useful output. WB agents perform cooperative simultaneous search. When the user is busy browsing, the WB agent organises further searches for useful material, downloads information in advance and creates *hot lists*. While the user is involved in depth browsing, the WB agent carries out breadth browsing trying to locate other sources that might satisfy the user's information requirements.

In order to organise an effective anticipatory search, the WB agent observes the user behaviour and guesses his/her intentions. The WB agent monitors aspects like the user returning to a particular page often, the user spending more time perusing a paragraph, etc. It then builds the user's interest profile and adds hyperlinks that may be relevant to the user requirements. Since Internet browsing sessions on a particular topic often last for many days, some WB agents do anticipatory searches even when the user is not logged on and provide the user an alert service about the new material gathered. Some powerful WB agents are capable of combining search results from a number of search engines and presenting a non-redundant and neatly organised list of results. Such lists can be viewed offline and updated automatically. Some WB agents are called *tour guides* as they offer the user a tour of the Internet.

There are two basic functions performed by WB agents: *navigation* and *information access*. Navigation through Internet is an integral part of every WB agent. WB agents often access information by invoking the services of information agents discussed in the next section. In such a case, the WB agents and the information agents are said to be cooperating.

### 19.5.3 Information Agents

Information agents are of two kinds: *Information Retrieval (IR) agents* and *Information Extraction (IE) agents*. IR agents search and produce a list of documents that possibly contain the information requested. The user then browses the documents to extract the desired information. The request for information is usually specified by a Boolean expression of keywords. The IR agent may use one of three search techniques: Boolean, probabilistic or state vector technique. IE agents, on the other hand, actually extract information from the documents and place the same before the user for his/her perusal. IE agents are an advancement over IR agents and have more intelligence built into them. Both IR and IE agents have learning capability. Both are used by Web Browsing agents discussed in Section 19.5.2.

Powerful information agents perform many additional tasks such as:

- Advanced search,
- Result analysis and management,
- Pinpoint key concepts,
- Result tracking and reporting, and
- Prepare summaries.

Intelligent IR and IE agents autonomously scan millions of documents and create an index of title words, keywords and text portions. As a result, they are sometimes called **web indexing agents**. These agents perform indexing function, more commonly, on behalf of large commercial search engines than individual users. The



user may then query these search engines using keywords to find the required information. Information agents are known by a variety of common names such as web robots, spiders, wanderers and softbots.

#### 19.5.4 FAQ Agents

Frequently Asked Questions (FAQ) agents are specially designed to answer questions that are frequently asked by a common man. It is assumed that the person asking the question is a non-expert in dealing with computers. Hence, emphasis is laid on natural language interface. This interface has two aspects: the user must be able to pose the question in natural language and the computer must present the most appropriate reply in natural language. Consequently, the FAQ agent has to deal with *natural language understanding* as well as *natural language generation*. Language understanding involves analysing the *syntax* and *semantics* of the sentence. The syntax of the language defines the structure of the sentences. In this sense, syntax is considered as a synonym for *grammar*. Semantics is concerned with the meaning conveyed by the sentences. The language understanding process is complicated by the fact that people tend to ask the same question in several different ways.

#### 19.5.5 Web Mining Agents

Web mining on the Internet is a natural evolution of **data mining** in large databases. Mining, as we know, is a process of finding some small valuable item from a large mass of material. Data mining is the process of finding valuable information that may lie hidden in large databases. Similarly, web mining is a process of discovering hidden valuable information on the Internet. Web mining agents usually perform the following functions:

- Resource discovery,
- Information extraction, and
- Generalisation.

Resource discovery is locating unfamiliar, but possibly useful, documents and services on the Internet. Information extraction is automatic extraction of useful information from newly discovered web resources. Generalisation is uncovering general patterns that are hidden at individual web sites or across multiple sites.

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### 19.6 DISTRIBUTED AGENTS

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Distributed agents are an outcome of research in Distributed Artificial Intelligence (DAI) that is concerned with problem solving in a distributed manner. A group of intelligent agents that are located in different geographical locations collaborate via network infrastructure to solve large problems. A problem in this context is such that no one IA in the Distributed Agents Environment (DAE) is capable of solving the problem. Expertise of more than one agent is required to solve the problem. This technique of solving large problems with the help of a number of IAs collaborating among themselves is known as Distributed Problem Solving (DPS) and the agents themselves are called **distributed agents** or **collaborative agents**. More recently the term Multi-Agent System (MAS) is being used to describe the Distributed Agent System (DAS). The term MAS is preferred by many because DAI environment comprises computers, human beings, sensors, instruments, robots and remotely operated and controlled vehicles. DAS or MAS may be defined as a *loosely coupled network of agents or problem solvers that collaborate and work together to solve problems that are beyond their individual capabilities*. Distributed agent systems are not only useful in solving large problems but also in some other situations.



For example, there is a large number of problems such as air traffic control and railway network management that are naturally distributed where MAS is useful. Where a problem requires information to be obtained from distributed sources, as in the case of corporate decision-making, use of MAS is very effective.

### 19.6.1 Design Approaches

There are two fundamental approaches to designing multi agent systems:

- Coordinated design, and
- Federated design.

Early work in DAI centred on coordinated design. The recent trend is to adopt federated design approach. In coordinated design approach, a single individual or a group of individuals oversees the design of all distributed agents. The emphasis is on designing agents that would cooperate and interact smoothly to achieve the common problem-solving goal. The performance of the overall system is given more importance than the efficiencies of individual agents. Systems following coordinated design approach are also called Cooperative Multi- Agent Systems (CMAS) or Cooperative Distributed Problem Solving Systems. Typically, coordinated design is practiced in single management environment like corporate sector. In CMAS, agents are assumed to be benevolent. Their main aim is not to compete but to cooperate for the greater good of the system.

In federated design approach, the emphasis is on designing individual agents that perform certain tasks efficiently and join other agents in a negotiated manner to solve larger problems. Motivated experts in the respective field of activity design such agents. The term *federated* signifies the presence of agents that have considerable autonomy in a distributed problem-solving environment. The agents are not under one single management. The management entities are different in each case. The main aim in this approach is to design agents that can maximise the benefits by performing certain specialised tasks efficiently. Cooperation is not a natural objective for these agents. There is no common problem-solving goal at the time of designing these agents. At the same time, these are not stand-alone agents that perform isolated functions. They work with other agents to perform large tasks. They come together in a negotiated manner instead of a coordinated manner. Since the agents are designed by individual experts, there may be more than one agent available to perform a given function. In such a situation, the prime problem solver sees a market place scenario and may choose one among many competitive agent providers in a negotiated and best offer basis.

When agents are designed for individual best performance, the resulting system is sometimes called Self-Interested Multi-Agent System (SMAS). The term self-interest tends to convey a negative connotation. There are authors who tend to think that agents in SMAS may even exhibit antagonistic behaviour. This may not really be true. Eventually, all the distributed agents work together to achieve a common problem-solving goal. In this Unit, we recommend the use of the term Federated Multi-Agent System (FMAS) rather than SMAS.

An analogy may place the coordinated and federated design approaches in perspective. Consider the construction of a large building complex involving a variety of tasks like architectural design, structural design, building construction, exterior finishing, interior decoration, landscape development, etc. Each task calls for an expert group that specialises in the respective area. The coordinated approach is like the construction work being carried out by a construction company that has in-house its own expert group for each task. The federated approach is like the



construction work being carried out by a company that enlists a number of specialist companies from the market on a negotiated agreement basis to carry out the various tasks.

### 19.6.2 Requirements

Distributed problem solving using agents requires three functions:

- i) Communication between agents,
- ii) Co-ordination for problem solving, and
- iii) Negotiation between an agent and the coordinator to resolve conflicts.

#### Agent Communication

A basic requirement for the functioning of distributed agents is a communication facility amongst them. Communication is required not only for exchanging unprocessed and processed data and coordination information but also for sharing knowledge hypotheses used, reasoning-behind decisions and the learning process. In this sense, the communication between agents is more sophisticated and complex and takes place at the level of human communication unlike other machine-to-machine communication in networks. Agents in a distributed environment communicate via an Agent Communication Language (ACL). In order to ensure easy interoperability between agents, ACLs need to be standardised. Standard ACLs are just evolving. As a result, many multi-agent environments tend to use adhoc ACLs that pose problems for interoperability, particularly in federated environments. Two standard ACLs are currently under development:

- i) Knowledge Query and Management Language (KQML)
- ii) Agent Response and Communication Language (ARCOL)

KQML is being developed by the Knowledge Sharing Effort (KSE) project of the Advanced Research Project Agency (DARPA) of the Department of Defence in the United States. Broadly, KQML has three parts:

- i) communication part,
- ii) message part, and
- iii) content part.

Communication part deals with actual protocols for delivering the message along with the contents. Message part specifies a performative such as *Tell*, *Reply*, and *Advertise*. Content part is the actual content that accompanies the message. One of the major shortcomings of KQML is the lack of precise semantics.

ARCOL is being developed by the French Telecom to overcome the limitations of KQML. ARCOL incorporates logic of mental attitudes, which allows semantics to be precisely specified in the messages. These standards are being promoted and supported by the *Foundation for Intelligent Physical Agents* (FIPA), an independent professional body that specialises in the area of multi-agent systems.

#### Co-ordination

Any large scale activity involving a number of small activities calls for co-ordination, e.g. performing a major operation on the human body, constructing a large commercial complex and such others. Similarly large scale distributed problem solving calls for co-ordination of the activities of the various agents to ensure that they act in a coherent and harmonious manner to realise the objective of achieving a common



goal. Co-ordination is also required to resolve conflicts that may arise between agents while performing functions that are interdependent. There are two ways in which multi-agent co-ordination is done:

- Organisational co-ordination, and
- Planned co-ordination.

The former is like the well-known co-ordination technique used in an organisation with a chief executive at the helm of affairs. For every distributed problem-solving situation, a master agent that has a wider perspective of the problem is created to oversee the activities of other agents involved in problem solving. The master agent gathers information from the other agents, creates plans, assigns tasks and allocates resources to individual agents in order to ensure global coherence. The sole responsibility of coordination lays with the master agent who often handles situations as and when they occur without prior planning.

In planned co-ordination all the agents in a DPS environment, play a role in formulating a plan for actions and interactions before hand to avoid conflicts while problem solving. Planned co-ordination may be carried out in a centralised manner or a decentralised manner. In either case, all the agents are involved in planning co-ordination. In the centralised mode, each agent submits its own plan of actions, interactions and interdependent operations to a central co-ordinator who performs the following functions:

- Analyse the plans and identify potential plan conflicts.
- Identify critical regions of plans around which agents should synchronise.
- Insert plan steps to ensure proper synchronisation.
- Eliminate conflicting interactions.
- Merge individual agent's plans and evolve an overall plan for problem-solving.

In decentralised planning, there is no central co-ordinator. The agents prepare not only their own plans but also model the plans of other agents with whom they are expected to interact. Agents then communicate in an interactive way to update and modify plans until all conflicts are removed.

In either mode of planning, blackboard architecture is often used to achieve co-ordination. In this scheme, agents post plans and to read plans from a general blackboard that is accessible to all agents. Modification are suggested and carried out to the plans in a conference mode until the conflicts are resolved.

### **Negotiation**

Negotiation is required at two stages in distributed problem-solving:

- i) At the time of putting together a group of agents for problem-solving, and
- ii) To resolve conflicts that may arise while problem-solving.

The former negotiation is usually done via a renowned negotiation technique known as *Contract Net Protocol* (CNP). A decentralised market model is basic to CNP. There are manager agents and contractor agents in the market. Manager agents are those interested in problem solving at some level. Contractor agents are those that have resources and expertise to solve sub-problems and make an offer to solve such sub-problems. An agent may both be a manager and a contractor at the same time. It may offer to solve a component problem to higher level manager and obtain

services from a set of contractor agents to fulfill this offer. A manager makes a contract announcement and invites submission of bids from contracting agents. On receipt of bids, the manager agent evaluates the bids and awards the contract to the most appropriate bidder.

In the context of selling and buying, as in the case of e-commerce, a class of agents known as *seller agents* and *buyer agents* are pressed into service. These agents are capable of selling/buying items on behalf of a user in a negotiated manner. They are often called *Price Negotiation Agents*. The guiding principle for a selling agent is the highest desirable price at which the bid should open, a formula for price reduction at every stage of negotiation and the lowest price beyond which the item may not be sold. Similarly, the buying agent is guided by the lowest desirable buying price, a formula for raising the price at every stage of negotiation and the highest price beyond which the item may not be purchased.

### Self Check Exercise

- 3) A selling intelligent agent announces a desirable selling price of Rs. 8000 for an item. In the first round of negotiation, the agent offers a price reduction of Rs. 256. The formula for price reduction is to offer a further reduction of half of the amount offered as reduction in the previous round of negotiation. What is the price offered by this agent at the third round of negotiation? What is the lowest price beyond which this agent will not sell the product?

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 19.7 MOBILE AGENTS

Networks are getting increasingly overloaded with traffic. With heavy traffic, the response time is increasing day by day. We have reached a stage where we need to make use of network infrastructure in a more effective manner. Mobile agents offer a solution in this regard. A Mobile Agent (MA) may be defined as *an intelligent program that can migrate from one host machine to another in a heterogeneous network and possesses navigational and computational autonomy*. By navigational autonomy, we mean that the program is capable of deciding when and where to migrate and choosing its route for travel. By computational autonomy, we mean that the program is capable of suspending its own execution, moving to another host on the network and resuming execution on the new host. In addition, being an intelligent agent it must possess some of the characteristics listed in the Table 19.1.

The underlying concept in mobile agents of a small executable program moving from machine to machine and executing itself on different machines represents a revolutionary change in the present day computational paradigm. At present times, executable programs are machine resident. The programs run on the machine in



which they are installed. For example a client program runs on a client machine and a server program on a server machine. They exchange data via a network as illustrated in Fig. 19.3 (a). The data exchange causes considerable network traffic that congests the network and leads to poor response times. On the other hand, in the MA configuration, the agent moves across the network and the data exchange is localised on the server host machine as illustrated in Fig. 19.3 (b).

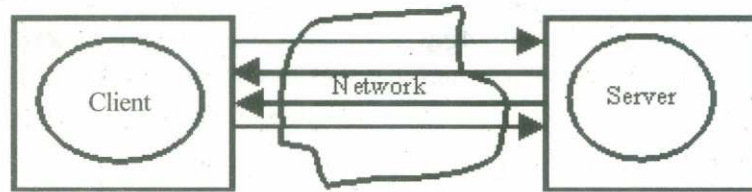


Fig. 19.3(a): Client-Server Configuration

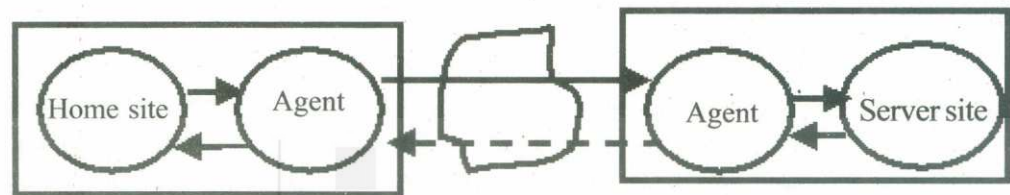


Fig. 19.3(b): Mobile Agent Configuration

The host computer in which the MA is normally resident is called its *home location*. Other hosts to which the MA may move and execute itself are called *visitor locations*. The long solid line arrow in Fig. 19.3 (b) signifies the moving of the MA from its home location to a visitor location (server host) and the broken line arrow indicates the return of the MA to its home site after completing its computation on the host site.

The MA approach reduces the network traffic significantly. Unlike the present day computational paradigm in which the data moves to the program, the new MA paradigm takes the program to the place where data is present. The MA technology is, however, just emerging and slowly maturing. Some of the well known MAs, at present, include Telescript of General Magic Inc., Aglet of IBM Japan, and Tel/tk and JAT Lite – Java Agent Template and infrastructure both of Sun Micro Systems.

### 19.7.1 Advantages

As mentioned earlier, mobile agents represent a revolutionary change in computational paradigm. Computation moves to data instead of data moving to computation. Such an approach results in a number of advantages:

- Reduce network traffic,
- Less use of network resources,
- Reduced network costs,
- Local control of real-time entities,
- Local processing of large volume data,
- Dynamic adaptation, and
- Free market applications.

The network traffic reduces on two counts. First, there is no data exchange on the network. Second, every data movement on the network involves a protocol that contributes to overhead traffic. Since there is no data exchange, the overhead traffic



is zero. Since only the mobile agent moves from machine to machine, there is minimal use of network resources such as buffer space in the intermediate nodes, which is required for large volume data movement. Network costs are reduced significantly, as the network is occupied only for a short duration to move the agent.

Real time entities can be controlled locally by dispatching a mobile agent to the destination node. Otherwise, the control is done remotely causing heavy demands on the network. Large volumes of data can be processed locally without involving network resources. Mobile agents, being intelligent, can adapt themselves to local conditions so that the intended task can be completed efficiently. For example, a negotiating agent may use different strategies depending on the response from the opponent. Mobile agents are naturally suited for applications that exist in a free market environment. Hence, they are ideally suited for e-commerce and e-trading applications in the information society.

## 19.8 OTHER INTELLIGENT AGENTS

The intelligent agents that we have discussed so far, i.e. Internet IAs, distributed IAs, and mobile IAs, form major classes of generic IAs that find wide application in a variety of fields. There are other types of IAs that have been discussed in the literature. Many of these are meant for specific applications limited in scope. Some of the important agents in this category are:

- Typed Message Agents
- Interface Agents
- Reactive Agents
- Hybrid Agents

**Typed Message Agents (TMA)** may be considered a special class of distributed agents that perform distributed computing using typed messages of an agent communication language (ACL) like KQML. They exchange messages in order to accomplish a task. The response messages are not necessarily a direct and limited answer to a query. The messages may include additional information voluntarily offered by the agent based on its intelligent capability. In this sense, the TMAs overcome the limitations of client-server interaction. Reliable message delivery is an important requirement of TMAs.

One of the main applications of TMAs is in the field of telecommunication. They are pressed into telecom relay services that are specially designed for speech impaired and deaf or hard of hearing persons. Consider the case of a speech-impaired person wanting to communicate with a normal person using telephone facility. The speech-impaired person types in his/her message on his/her terminal. The message is then sent to TMA which synthesises the message into voice and transmits the same to the receiver. The receiver's voice reply is sent as it is to the speech-impaired person who can obviously hear the message. Similarly, if a person who is hard of hearing wants to use the telephone service, the TMA translates the response voice into a message and displays the same on the person's terminal. The hard of hearing person's speech is, however, transmitted as it is to the recipient. A TMA is different from a simple speech recognition and speech synthesis system. TMA, being intelligent, attempts to make the process as natural as possible. It learns the traits of its users and applies them in speech and message translation process.

**Interface Agents** are like personal assistants. They work closely with the user and cater to a variety of user needs. The work environment being the same for the user



and the interface agent, they access the same applications and share the same databases. Some of the important functions of interface agents include calendar maintenance, scheduling meetings, provide memory aids like a reminder about a scheduled meeting, draft replies, filter incoming messages and buy/sell on behalf of the user. Scheduling function involves accepting or rejecting proposal for meetings, and negotiating and finalising meeting timings. The interface agents learn about the preferences and commitments of the users and act accordingly. The functions that an interface agent can perform form a long list. Every conceivable activity of a personal assistant can be built into an interface agent. Most of the tasks of a personal assistant are management oriented. Examples of such functions are information distribution, monitoring, sorting, summarising, translating, report preparation and alerting.

**Reactive Agents** are those that become active when an event occurs or a situation arises. They are mainly used in process control applications. They are different from ordinary process control software. They learn from experience and improve their perception of a situation and the decision making process. **Hybrid Agents** perform more than one agent function and may be regarded as **Meta Agents**.

### Self Check Exercise

- 4) Explain the role of a typed message agent when a speech-impaired person wants to communicate with a deaf person.

**Note:** i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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## 19.9 AGENT TECHNOLOGY

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Intelligent agent technology is a part of artificial intelligence (AI) technology. Developments in AI technology started in the 1950s. Since then, efforts have been underway to build expert systems, natural language processors, robots, computer vision systems, intelligent agents, etc. Of these, the most widely applied and commercially successful AI technology is the **expert system**. The expert systems have been in use since late 1970s. On the other hand, the agent technology is relatively new and has evolved during 1990s. Now then, are intelligent agents a natural evolution of expert systems? The answer to this question is a firm "No". There are certain functions, application areas and characteristics that are common both to expert systems and IAs. But the IA technology is vastly different from, and much more general than that of expert systems.

Expert systems deal with specialised and usually narrow problem areas. Knowledge capturing and inferencing are the two most important functions of expert systems. They capture knowledge from experts or documented sources and create a knowledge base. They use this knowledge base, make inferences and take decisions for a user.

Intelligent agents also form knowledge bases, make inferences and take decisions. Most of the expert systems are stand-alone packages. Intelligent agents may be stand-alone as in the case of interface agents, collaborative as in the case of distributed agents or cooperative as in the case of WB agents. Mobile agents add yet another dimension to the agent technology. Agent technology has evolved not only from AI technology but also has drawn extensively from distributed computing and databases, software design and network technology. The vastness of agent technology is leading to the emergence of a new discipline called *Agent Based Software Engineering* (ABSE) or *Agent Oriented Software Engineering* (AOSE).

Coming with new dimensions in computing, IA technology includes aspects that are not part of conventional software technology. The following are the different aspects of IA technology:

- Agent characteristics or Agent model
- An environment suited for IAs
- Agent Life-cycle model
- Computational model
- Navigational model
- Security model
- Communication model

First of all, being an intelligent program, an IA must have the essential characteristics of an intelligent agent. These include autonomy, cooperative, independent, and collaborative functioning, mobility, and learning and decision making abilities. These are intelligent aspects derived from AI technology. A typical environment for IAs to execute on a host computer system is shown in Fig. 19.4. The environment is sometimes called agent's **virtual machine**. At the top of the virtual machine is the user who runs an application. The application program invokes one or more IAs to perform the intended tasks. These agents may be stand-alone, distributed or cooperative. Mobile agents are usually under the control of resident (immobile) IAs. They are invoked by an intelligent agent that runs only on the host system. The invoking agent is sometimes called the dispatching program. In some designs, application programs may directly invoke the mobile agents without going through an IA layer.

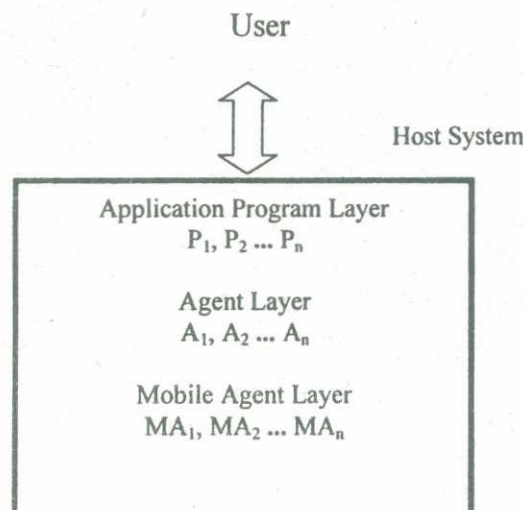


Fig. 19.4: Intelligent Agent Environment



The other aspects of IA technology is concerned with functional and software architecture of the IAs. A layered architecture of IA software technology is shown in Fig. 19.5. There are six layers in the architecture. At the top level is the agent characteristics layer and at the bottom the communication layer. As mentioned earlier, the agent characteristics layer is concerned with intelligence aspects of the agent.

The life-cycle layer deals with IA process states. An IA may be in one of the following states: *dormant state*, *ready state*, *execute state*, or *suspend state*. Initially the IA is in the dormant state and is inactive. When invoked, an IA or MA enters the ready state. From the ready state, it moves to Execute state as soon as the processor is allocated for it to execute.

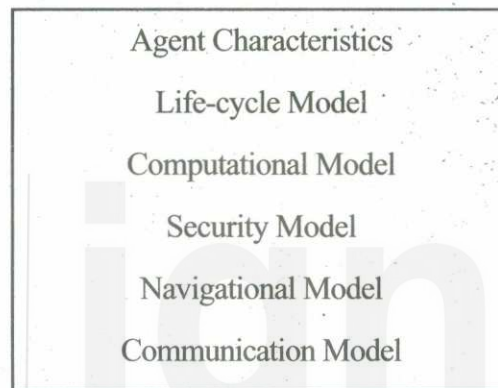


Fig. 19.5: Software Architecture of an Intelligent Agent

In the case of mobile agents, there is an additional state called *transit state*. A mobile agent must suspend itself before moving from one host to another. It may be in Transit State moving from its home location to a visitor location or from one visitor location to another or from a visitor location back to the home location.

Computational structure of IAs deals with modularisation of agent program, inter-module communication, data manipulation and execution control. It is also concerned with data abstraction and knowledge base management. Knowledge is usually organised as rules or frames in an object-oriented fashion.

Security features are particularly important for MAs and deal with two aspects: protection of the visitor location computer programs, the network and other mobile agents from a destructive mobile agent; and protection of a mobile agent from a destructive visitor location. Use of proxies and import restrictions protect visitor location programs. Secure interaction protocols and agent communication languages (ACL) protect other mobile agents. Use of secure channels and export restrictions protect the network. Destructive visitor hosts tend to scan agent's confidential data, alter the agent's database or the code and attempt to kill the agent. It is rather difficult to protect a mobile agent from the visitor host. Access control mechanisms are usually used to safeguard mobile agents from malicious hosts.

Navigational aspects include discovery of new hosts, finding out the physical locations of the known hosts, rendezvous and route planning and actual transportation. An ACL, like KQML, is used for communication between two agents and graphical user interface (GUI) for communication with users.

## 19.10 SUMMARY

This Unit is concerned with Intelligent Agents (IAs) that are expected to play a significant role in the upcoming-networked information society. After bringing out that intelligent agents are smart software programs that provide intelligent inputs to human beings for performing their jobs better, the Unit dwells upon formal definitions for IAs. What constitutes intelligence and how to test for intelligence are discussed next. Learning is an important characteristic of intelligence. Hence, the process of learning in IAs is then dealt with. This is followed by detailed treatise on Internet agents. Five important Internet agents are then discussed. Major classes of IAs, viz. distributed agents and mobile agents are dealt with in detail. Other agents like typed messages agents are briefly described. Finally, the Unit presents a discussion on agent technology which has enhanced even the software engineering field.

## 19.11 ANSWERS TO SELF CHECK EXERCISES

- 1) An intelligent agent is an autonomous or semi-autonomous user-friendly software that is capable of taking decisions proactively and assist the user in an intelligent way by learning from the user. It can work in an independent, cooperative or collaborative manner, move from one machine to another, and run on wide variety of computer platforms.
- 2) Gathering relevant information is the job of an information expert. A senior executive of a business house, like the Chief Executive Officer or the Managing Director, knows best the information requirements of the business. Therefore, an information scientist should act as an expert and a top executive of the corporate house as the tester.
- 3) Announced selling price = Rs. 8000  
 Reduction in the first round = Rs. 256  
 Reduction in the second round = Rs. 128  
 Reduction in the third round = Rs. 64  
 Therefore, the price at the end of third round is  $8000 - 448 = \text{Rs. } 7552$   
 The lowest price is  $8000 - (256+128+64+32+16+8+4+2+1) = \text{Rs. } 7489$
- 4) A speech-impaired person cannot speak but can hear. A deaf person can speak but cannot hear. Hence, the message from the speech-impaired person will be sent as it is to the deaf person. Speech of the deaf person will be translated to a message by TMA and sent to the terminal of the speech-impaired person.

## 19.12 KEYWORDS

|              |                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------|
| <b>ACL</b>   | : Agent Communication Language.                                                                        |
| <b>Agent</b> | : A computer program that performs a function that is normally carried out by an agency in daily life. |
| <b>AOSE</b>  | : Agent Oriented Software Engineering.                                                                 |



|                               |                                                                                                                                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ARCOL</b>                  | : Agent Response and Communication Language.                                                                                                |
| <b>Collaborative Agents</b>   | : Agents that work together to achieve a common goal.                                                                                       |
| <b>Cooperative Agents</b>     | : Agents that help each other by providing the requested service.                                                                           |
| <b>Data Mining</b>            | : Discovering hidden valuable information from databases.                                                                                   |
| <b>FAQ</b>                    | : Frequently Asked Questions.                                                                                                               |
| <b>Information Extraction</b> | : Search and extract the requested information from documents.                                                                              |
| <b>Information Retrieval</b>  | : Search and produce a list of documents that may contain the requested information.                                                        |
| <b>Intelligent Agent</b>      | : An agent that possesses certain attributes that are associated with human intelligence.                                                   |
| <b>Interface Agents</b>       | : Agents that perform the functions of a personal assistant to an office executive.                                                         |
| <b>Knowledge Base</b>         | : Organised knowledge in computer readable form.                                                                                            |
| <b>KQML</b>                   | : Knowledge Query and Management Language.                                                                                                  |
| <b>Learning</b>               | : An intelligent attribute that signifies some form of learning.                                                                            |
| <b>Mobile Agents</b>          | : Agents that are capable of moving from machine to machine in a heterogeneous network environment and executing themselves on any machine. |
| <b>Navigational Autonomy</b>  | : Ability to choose destinations, select route, and plan itinerary autonomously.                                                            |
| <b>Process States</b>         | : Different states in which an active agent program may exist.                                                                              |
| <b>Semantics</b>              | : Concerns the meaning conveyed by sentences.                                                                                               |
| <b>Syntax</b>                 | : Defines the structure of sentences in a language.                                                                                         |
| <b>Typed Message Agents</b>   | : Agents that interact with each other via typed messages to perform a function.                                                            |
| <b>Turing Test</b>            | : A test for intelligence in software devised by the British scientist Alan M. Turing.                                                      |
| <b>Web Browsing</b>           | : Navigating through Internet to reach different websites and accessing their contents.                                                     |
| <b>Web Indexing</b>           | : Scanning of documents on the websites and creating an index of keywords, etc.                                                             |
| <b>Web Mining</b>             | : Discovering from websites valuable information that may be hidden in their contents.                                                      |

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## 19.13 REFERENCES AND FURTHER READING

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