



BLOCK 3

MEDIA AND PUBLISHING TECHNOLOGY

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UNIT 8 PRINT AND NON-PRINT MEDIA

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8.0 OBJECTIVES

Information is now available in varieties of media and formats. This has been possible due to development of Information and Communication Technologies (ICT). However, the print media is still a dominant media for recording and dissemination of information. In this unit we will be discussing various media which are now used for recording and dissemination of information especially those emerging with the influence of computer storage technology including Multimedia, Hypertext, and Hypermedia.

After reading this Unit you will be able to know about :

- the concept of Print and Non-print Media;
- the characteristics and forms of Print and Non-print Media;
- the factors for the emergence of Non-print media;
- the influence of Information Technology for the emergence of new media;
- the emergence of electronic, magnetic, optical and digital Media;
- the concept of Multimedia, Hypermedia and Hypertext; and
- the importance of Hypertext in future.

8.1 INTRODUCTION

Recording and storing information on different media is an integral part and constitutes the study of influence of Information and Communication Technology on library and information science. There are several such media that have been evolved since the mankind started keeping records of events, activities and achievements. The constant fear of information growth particularly in print media has always tended to threaten the libraries for the storage, reference and preservation of information. Hence, all the professionals concerned— librarians, printers and publishers and users alike have come under the influence of these changes and adopted themselves and this process goes on.

The Paper is an important and integral component of print media. The unit, thus, begins with print media and then progressively profiles the utilities, influences and the limitations of this media. As it has been mentioned earlier that information is available in non-printed media also. The last two decades of the previous century saw some new media for recording information, in addition to print media. They include microforms, audio, visual and audio-visuals, and now optical and digital media. The non-print media, alternatively called as non-book material, could be broadly grouped as Microforms and Audio-Visual Materials for the purpose of this lesson.

In addition, the Micropublishing like Book Publishing also emerged as a specialist publishing activity during 1970s and 1980s. The advent of electronic media, and the integration of micrographics with computer science and technology, diminished the importance of microforms. The developments in computer and communication technologies have brought prolific growth of electronic media in recent years.

During the four decades of its development phase from 1945-1985, number of visionary thinkers, artists, writers, computer scientists have contributed to its present realization. The major steps in this media fusion process and developments were starting with telephone and telegraph networks and cinematography in the 19th Century, the invention of television in the 1930s, the digital computer in the 1940s and 1950s, and the emergence of personal computer in 1970s. It was the convergence of these technologies in the late 1970s and early 1980s that finally provided the framework for consumer usable interactive multimedia.

8.2 ROLE OF DIFFERENT MEDIA IN INFORMATION COMMUNICATION

'Media' is of course the plural of medium which is the conductor, the channel, and the means by and through which information is transmitted. The paper has been a medium for centuries in transmitting thoughts in writing. Contemporarily different physical and logical media have been integral part of Information Communication. From the ancient past for the transmission of knowledge man has used oral media, and then various forms of physical media such as, scrolls, written documents, manuscripts, papyrus rolls, vellum, metals and stones and variety of other media. From earliest time man has attempted to use the contemporary media for the preservation of his thoughts for future use. Preservation for posterity was though an older adage, but has been in the reckoning in recording and preserving scholarly knowledge for the generations to come, and now in the electronic era of today, digital media—a virtual media, is also intended to do the same function. For about 5,500 years, man has made use of local material and technological facilities in this context. The 'modern' technology can be considered relative to the time of its adoption and use. Gradually these local technologies turned to universality after invention of paper and printing as the two spread horizontally to the two hemispheres. The first part of this Unit will provide you with a consonant description on Printing and Paper media followed by the description on the advent and characteristics of Print Media.

The invention of movable types by Johann Gutenberg in mid 15th Century (1455 A.D.) ushered in an era of mass production of documents in print media. Their wider distribution thus marked the medieval era. In the modern or so called technology era, efficient methods of printing were developed and adopted to mass production of printed documents. The advent of photography, along with further improvements in printing and bringing colour to documents and also the micro-reproduction of documents in the mid 19th Century brought in the second change. The mid-20th Century saw the libraries to handle a variety of media—the books—paper-back and hard-bound, microform, art prints, periodicals, audio materials, motion films, slides, film strips, models, realia, and many more which Ranganathan categorized them as neo and non-conventional documents. From 1980s onwards libraries began ascent to new media. With the import of Information Technology on 'Document' media, thus emerged magnetic, computer processible and readable—the optical and multi media. Today, in addition to this there is an upsurge of video, audio, digital video, on optical media and the Internet, emerging as major information communication media. The study of the role of changing media has been primarily important in the transmission and communication of knowledge in the present society, where information is being transformed into knowledge.

Thus, we all know now that information is available not only in ancient world, in printed formats but also available in variety of non-print media. Society is now in information and knowledge era, the media has been attempting to keep pace with changing technology as a means of serving the needs of different libraries. The information technologists have been talking of paperless society, but not only paper has a no vanishing effect, but the media older than paper are still in existence. Hence all media invented before and after, and the emerging ones are now continuing to coexist.

8.3 HUMAN ENDEAVOUR IN SEARCH OF MEDIA

In different phases of civilization man has been in constant search for and adopting the surfaces, looking for other alternatives and also for a long lasting permanent, durable medium to record and store knowledge he has gained through the environment around him. The recording surface has been under constant transformation. Importantly, a few factors for this change in the early years could be reasoned – the ease of recording, permanency, portability, use and re-use facility, and the availability of local material and method of reproduction. Furthermore, some of the newer media emerged due to the positive impact on the indication of the valuable service that the newer media can provide in information communication.

For centuries several media have served as storage and transmission devices in education. However, the level of sophistication of newer forms of media, such as computers and video formats is playing greater role not only on its users and producers, but on information professionals as well. All these media assume more central roles in their correct and integrated use for finding solutions to information storage problems and, therefore, information professionals are expected to be familiar with them. The constant search time and again, has given rise to three distinct surfaces for recording of information- print, non-print and machine-readable media.

Ever since the invention of paper and movable type of printing the dual have revolutionized the knowledge communication until the mid-1970s when it seemed that the search for a durable, convenient and mobile media had diminished. But for the various reasons the situation got changed suddenly. Some of the fears that made man to think again for the alternatives are:

- fears of paper shortage, life of print media, cost of printing;
- fears of information explosion in print and handling of large volumes of data;
- fears of durability of paper for eternal preservation.

Besides the above, the needs of different libraries also demanded for the alternatives and the non-print media providing appropriate solution gradually started substituting paper for the following needs such as:

- archiving;
- preservation of historical documents;
- preservation for posterity; and
- preservation of classics.

The print media coupled with movable type printing and invention of paper that have over the years have heralded the contemporary information and knowledge society. Let us begin first with print media and then the non-print media and finally the Electronic Media comprising magnetic and optical media- their advent, physical characteristics, growth, use by the library and advantages and disadvantages .

Self Check Exercise

- 1) State the role of different media in information communication.

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

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

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8.4 PRINT MEDIA

The influence of paper, printing, and publishing on education & resurch, other activities and on the libraries is enormous. The paper is an important and integral component of print media.

8.4.1 Advent of Paper

Paper gets its name from *papyrus* and was invented in China in 105 AD. by Ts'ai Lun, who served in the court of Emperor He Di Ts'ai Lun. Later, the Chinese found the art of good paper making fibers by pounding rags, hemp rope and old fishing nets into a pulp.

The Chinese art of paper making spread to other parts of the world after several Chinese paper-makers were captured by Arabs in what is now Soviet Turkistan. The Arabs urged the paper-makers to continue their art and teach it to the Moors in the city of Samarkand. The paper industry was established in Baghdad in 795 AD. Paper making spread to Europe as its manufacture was first recorded at Jativa in Spain in 1150 A.D. It was introduced in England by John Tate in Hertford. The first paper mill in America was established in Philadelphia in 1690.

In 1798, a Frenchman named Nicholas Louis Robert invented a machine to make paper in continuous rolls rather than sheets. The Fourdrinier brothers, the English merchants, financed improvements in this machine in 1803. The first American Fourdrinier machine was built in 1827.

The paper is traditionally used for handwritten and print media. Paper as a medium for information storage is used in a wide range of other documents—charts, wall charts, posters, flipcharts, handouts, atlases and folders, apart from conventional documents like the books.

Print Media is one of the first to be associated with mass communication and has played a significant role in the process of democratisation of education and spread of knowledge. The Book is a common form of Print Media. It may contain words that are meant to be preserved for the future as well as for the present. Newspapers and magazines constitute other forms of print media.

8.4.2 Paper Sizes and Paper Finishes

Paper has varieties of qualities and dimensions. For printing of books, newspapers, magazines, office stationeries like letter heads, etc. there are different types of printing which need different sizes and qualities of paper. There are two basic categories of paper sizes. First the British Standards 730 and 1413 and the second is the standard of International Organisation for Standardisation (ISO). The International Standards Recommendation 3000 refers to paper sizes A, B and C. There is Indian Standard (IS:1064-1961) on paper too.

The British Standard sizes are: Foolscap, Post, Crown, Demy, Medium, Royal and Imperial. The international sizes are designated as : A-Series, B-Series and C-Series. The paper qualities on the type of finish are: Machine Finish, Super-calendared, Imitation Art paper, Art Paper, Antique Paper, Featherweight Antique, Twin Wire Paper, Cartridge Paper, Offset Cartridge, Bible and Mould-made Paper and so on.

8.4.3 Paper and Printing: The Proliferation of Print Media

If script is the first among the man's most significant inventions, second being the invention of printing by movable types. Perhaps no event in human cultural history exceeds importance of printing with movable types. Johann Gutenberg in 1455 AD invented the movable types for printing press, since then the printed world has been shaping the civilization of the World. The combination of paper and the printing press has probably done more to preserve man's accomplishments than any other single human achievement.

Print media, composed of several media, no doubt is more popular and common than any other media in practice. The print medium is very powerful medium and is likely to remain as the core- medium of communication in the days to come in spite of the emergence of new technologies in printing and information communication. Book as a print-media has effectively used for control and content and found to be very effective in handling historical information. The permanency and immutability of books is a great strength and also its weakness too. But the dominance of print media is on the threshold of change as the electronic media has been gaining dominance over print media.

A print media profile shows that, libraries comprise largely of print media. These are acquired, stored, organized and put into use for the clientele. The major contribution to the growth of all types of libraries comes primarily from print media.

8.4.4 Categories of Paper Print Media

The table 8.1 shows categories of print media in use.

Table 8.1: Categories of Print Media

Brief Text Media	Paper-based Visual Media	Continuous Paper Media	Machine Readable Lengthy Text
Sheets	Displays	Book	Punched(Paper)Tape
Folders	Mobiles	Journals & Magazines	Punched Card
Leaflets	Charts	News Papers	
Handouts	Flip Charts		
	Posters		

Book: The Ubiquitous Print Media

At the General Conference of UNESCO (1964), a book was defined as a non-periodical printed publication of at least 49 pages, exclusive of cover pages. A book has a set of blank sheets of paper bound along one edge and enclosed within protective covers to form a volume. Books in libraries are the most familiar form of print media. Books can be of various sizes, forms e.g. reference books, textbooks, atlases, dissertations, etc. In the following section, we have considered “Books” in totality and the purpose is to highlight the Book as an integral part of Print Media.

Characteristics of Books and Other Similar Documents

The book as a print media has some common characteristics, also some strengths and weaknesses. The following attributes of book are only illustrative:

- i) They are extensive bodies of information, integrated into wholes or of discrete data.
- ii) They are fixed: additions or corrections of the data is complex need re-doing.
- iii) They are slow to produce though the process has become faster due to the availability of desktop and electronic publishing technologies. Information in a book typically becomes old, the moment it is produced.
- iv) Books are convenient, easily portable, require no apparatus or connection to read or consult.
- v) Books are/can be aesthetically pleasing.
- vi) One can read it at leisure and convenience compared to reading from the screen.

The above characteristics show only certain functions of books and now they are gradually being replaced by *electronic media*, which do superbly many things that books cannot do at all or do very poorly. But, it also suggests that books still perform better than any other medium and serve within their special competence.

The real competition between books and electronic media might be in the field of *those books* which are designed to be consulted rather than read occasionally, like the Reference Works; Dictionaries, Encyclopaedias, Directories, etc. The CD-ROM Technology and Websites have already made their mark and facilitating their use more comfortably than before.

Further the need for *up-to-date* or *up-to-the minute* data makes print an *obviously disadvantageous medium*. The advantages of such systems is not in the storage and presentation of text, at which print remains superior, but in their indexing power, which facilitates easy retrieval of relevant pieces of information.

a) **Textbooks, Magazines and Periodicals:** The textbooks are one category of Books that may provide an excellent example of a product on print-on-paper. However, a multimedia version of the same could quite conceivably replace the textbook. With the enormous storage capacity of Digital Versatile Disc, the possibility of replacing printed textbooks with multimedia cannot be ruled out. Rapid changes in production methods have made it possible for research publications to go electronic, faster than Books. One of the prolific growths in this direction is in the form of e-journals. Almost every magazine has gone electronic plus a print version. So it will be the parallel going at least for some time to come and total replacement of book especially with electronic version cannot be visualized in the near future, and may get extended life for some more time.

b) **Newspapers:** Newspapers constitute an important area of Print Media. The production of newspapers, big or small, local or international are now in electronic medium and most of them are now on the Web. Today, the technology used in their production is entirely like an in-house production with worldwide coverage. The newsrooms of today get their every input directly on to the Editors desktops. Apart from this, full text computer based systems have been designed for general news reports. There were large scale attempts to bring newspapers on microfilms. In the current state of their developments it is likely that most of the newspapers would totally go electronic and accessible via Internet. However, the print versions are delivered at homes regularly all over the globe. This dual forms of the newspapers as a *print media and electronic media* would also continue.

One thing must be clearly understood here is the reasons as to why alternatives to the traditional book or journal/newspaper are being thought of as a matter of intense concern. Some of the reasons could be: production costs of print-on-paper, on the other hand the speed of access and dissemination has improved substantially in the last couple of years. In comparison, the electronic transfer of information has become least expensive, handling of data has improved markedly and speed of transmission is high. One can readily envisage some kind of cross over point where the virtues of electronic media may outweigh those of a print-on-paper.

8.4.5 Future of Print Media

It might be stated that integration of printing and electronic technologies offer unique advantages for information transfer such as; flexibility, rapid delivery at low-cost, compact storage, and interactivity. But it would be difficult to make a wholesale substitution of print by electronic media. This also makes it rather unrealistic to assume that the technology *will replace* print as a major medium of dissemination, and transform everything into electronic or as digital form, and that it would not likely to happen in the foreseeable future. On the contrary, the arguments put forward in favour of electronic systems suggest that there would be considerable need and demand for those back up and archival mechanisms provided by printed media. There will be many areas where electronic systems might be very useful, but the need for print on paper will continue. In fact far from threatening the viability of print, the emergence of a whole new spectrum of new technologies along side print, may well increase rather than decrease the use of printed formats, by generating many new opportunities for those communication activities for which print is most suitable.

There is a complimentary growth of bibliographic databases and full text journals both in printed and electronic form. This pattern is likely to be extended as new media can come into more general use, and their capabilities for information transfer are being very high. The print media on the other hand would suitably fulfill the needs of back ups and archival. In this environment a variety of media co-exist and complement one another and where specialisation of function in terms of such criteria as cost and convenience is likely to develop. This will certainly, increase the flexibility and the efficiency of information transfer. But specialisation and complementary aspects are not simply a matter of whether different kinds of information will be finally accessed by the user in the soft copy form, via a screen or in some form of *print on paper product*.

To put it in another way, the technology may stand as a substitute for print media or vice versa. But their principle will be, on the one hand to afford kinds of information dissemination not possible by the use of print and therefore not previously available, and on the other, to make the production, marketing and delivery of print media much more economical and efficient, using of course the technology. The deliberation on the survival of print media and its future is an ongoing debate and affirmative decision on this or that is futile. The duality of co-existence will continue, with no disadvantages.

Self Check Exercises

- 2) From where did paper get its name and who invented it? Trace its spread in other parts of the world.
- 3) Explain in brief the concept of print media and its categories.
- 4) Does print media has a future?

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

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

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8.5 THE NON-PRINT MEDIA

Information explosion in print form is one of the main reasons for the advent of non-print media. The emergence of non-print media came primarily as supplement to print media for varieties of reasons such as storage, limited utility, etc.

8.5.1 Why Non-print Media?

The advent of direct reproduction technology, i.e., the convergence of printing with computer technology facilitated the advent of new media. New role of different libraries in handling different forms of information sources is also one of the reasons to adopt the non-print media.

The following factors are important for the advent of non-print media:

- a) Radical change in the methods of dissemination of information;
- b) Advantages in knowledge absorbing has higher power of retention;
- c) Embodiment of knowledge – retention, handling convenience;
- d) Technological impact; and
- e) Socio-economic implications.

The knowledge of different aspects of non-print media is necessary for the following reasons:

- a) problems of handling new media by libraries – acquisition, storage, and use;
- b) problems of format;
- c) study of user needs and change of media;
- d) problems of stability;
- e) copyright problems; and
- f) cataloguing, documentation and other processing work;

8.5.2 What is Non-print Media?

Non-Print media are the sources where information is available in non-conventional form. It may be audio-visual and varieties of microforms. Even maps, atlases and globes, etc. are sometimes included. However, no suitable definition is available to encompass precisely the term or it is difficult to provide a suitable and acceptable definition, therefore we would list the non-print media that normally include:

- 1) Photographs, film slides, transparencies;
- 2) Realia, mock-ups, models and specimens;
- 3) Phono-recordings, including discs;
- 4) Audio tapes, cassettes and cartridges;
- 5) Motion pictures, Video Tapes, Kinescopes;
- 6) Portfolio, Kits;
- 7) Maps, Atlases, Globes;
- 8) Microforms;
- 9) Magnetic Media; and
- 10) Optical Media.

The Magnetic Media and Optical Media, as Electronic Media are dealt in separately in later sections.

8.5.3 Categories of Non-print Media

There are varying opinions on inclusion of different categories of materials in non-print media. Primarily we would include 'Audio-visuals' and 'Electronic Media'. Audio-visuals include also the microforms. These are primarily useful in the context of libraries. Maps, atlases and globes which would be considered as audio-visual but these are in printed form, and are separately known as non-book material. The forthcoming sections would describe Microforms, Audio, Visual and Audio-Visual materials only.

Microforms

The microforms entered libraries in 1960s. Libraries then acquired microforms to overcome their budget cuts and inflation, to avoid unlimited extension of library stacks, to maximize acquisition of relevant information with their inelastic budgets, to cut the delays in acquiring information and to achieve ease in handling and storage. Microforms were once considered modern, efficient, compact and powerful media with their own advantages and disadvantages.

Their main advantages are: (i) economy (ii) saving in space (iii) speedy acquisition (iv) file integration (v) easy mechanization and automation (vi) low cost on-demand information

dissemination and distribution (vii) easy to archive and have security of information and protection of records (viii) easy to store, handling and retrieve (ix) ecological value and control of paper, pollution and cost, (x) integrity and durability of collection (xi) easy reproduction and aesthetic quality, (xii) longevity.

The microforms came in a situation where they could provide some kind of solution to print explosion. And predictions and guesses are attributed to contain whole of Library of Congress in a small room with meager maintenance costs. The problems libraries faced were regarding space and the crisis of increasing paper shortage. Such critical situation was solved with the solutions provided by microforms and with them the collection development found to be more fruitful and economical. There was a strong contention to advocate only a selective collection development in microforms and not for a total replacement of print media. The use of microforms was brought in library environment in or around 1930's. An exploratory phase began since then and from 1960's they were very much a part and parcel of the libraries. The essential characteristics of Microforms are three R's — *Reduction, Reproduction and Retrieval*.

Definition and Evolution

Microform is a generic term identifying visual information originally in paper form, which has been photographically reduced. In other words, it is a term for any medium, transparent or opaque, bearing micro-images. The process is a photographic process of making greatly reduced documents which can be read only by magnification and the process of their reproduction is called Microphotography and has been one of the main divisions of Reprography. Technologically it is generally called as micrographics.

The history of microforms is traced to Microphotography – the process of making photographs on a greatly reduced scale. The first attempt to produce micro-images through photography was made by John Benjamin Dancer in 1839. Microfilm which is one of the products of Microphotography was initially used only to save storage space and to provide security to the contents of valuable originals. During 1870-71 it was used by Rene Dagron in Franco-Russian War, and the famous 'Pigeon-post' made the beginning of carrying messages in microforms. In World War II the Dagron experiment was repeated and called by the name V-mail. These events resulted in a major growth of microform technology, with the need for European countries to preserve documents from destruction. During 1929 and 1935, the microforms found application in document reproduction – the League of Nations Committee considering Microfilming for documentation and the U.S. Government for National Recovery Administration. By 1960s, micro-publishing was an established publishing industry, serving the information acquisition and storage. In its most advanced form, the computer output microform (COM) is produced directly from the data/text generated by a computer onto film.

The main categories of microforms by their physical format are of two types: Roll and Sheet. However, by their processes they are categorised as (a) Micro-transparencies; and (b) Micro-Opaque.

- a) Micro- transparencies read by transmitted light can be further subdivided as:
 - i) Roll Film;
 - ii) Unitised Microfilm; and
 - iii) Sheet Microfilm or Microfiche.
- b) Micro-opaque – a sheet of opaque material bearing number of micro-images in two-dimensional array are micro-cards of 3" x 5" size made on a sensitized photographic paper. Microprints are 6" x 9" microcopies produced by Lithographic printing.

Several types of micro-opaques or micro texts are known, the commonest of which are Microcards and Microprints. All differ in size and in the number of images they contain. Originally, these opaque cards were produced by contact printing from 16 mm or 35 mm

microfilm cut into specified lengths and positioned in a special frame. Micro-opaques have two serious disadvantages against conventional, transparent microforms —

- a) They are not of extremely high resolution as is possible in micrographics.
- b) They require a considerably brighter light to view the reflected images.

In the 140 years of its existence micrography has changed from a difficult and often unpredictable process to a simple, effective and repeatable technique for the storage of all types of documents. The problems of high-quality micro-image production have largely been solved. However, two important aspects still remain as a barrier to the much wider application of microforms, namely satisfactory reader design, and rapid methods of retrieval. The technology of production and use of micro-opaques has been totally outdated and hence further discussion of the subject is not attempted here.

8.5.4 Micro Transparency Formats

Roll Microfilm

It is the transparent (translucent) media, pages arranged sequentially. This form is available in 8, 16, 35 and 70 mm sizes. The roll films are packed in 100 feet reels, cartridges and cassettes. They are available in three modes—Cine mode, Comic mode, Duo mode/ Duplex mode. The reduction of roll films ranges between 10x and 24x. Roll films are still a popular choice because of large amount of information can be stored in very little space, at a very low cost. The frame sizes vary with or without perforation. Thirty-five millimeter reel microfilm has such a long history of use in library applications that some authorities consider it, for better or worse, the *de facto library* standard. The 35 mm film width affords the large image area necessary for the reproduction of newspapers, maps, charts, and other documents at low to medium reductions. The 16 mm reel microfilm was used in many commercial applications. Commercial micropublishers have encouraged the adoption of 16 mm microfilm, since economies are possible through the simultaneous production of 16 mm microfilm and microfiche at 24X reduction.

Unitized Microfilm

It is prepared from roll microfilm and usually is in the form of

- i) strips containing 10 pages each;
- ii) acetate jacket containing a strip or strips of film; and
- iii) aperture card or window cards mounted on a punched card with an aperture for the frame. It also includes slides.

Aperture Cards

Aperture cards contain a single image, or up to eight page-size images on one 35 mm frame. Aperture cards are available in several sizes but the one in most common use is 82.5mm x 187.25mm. A frame strip of 35mm film is permanently fixed on to an Aperture mode on a punched card. The punched card also bears the brief information about the contents of the strip and can be read without magnification. More than one image with related texts can also be combined into an aperture card, similar to Jacket films. These can be used for mechanical storage and retrieval as well as for handling in manual form.

Aperture cards may be produced either in a two-stage method, by cutting and mounting film produced in roll microfilm camera, or directly by a special aperture card camera designed specifically for the purpose. Many aperture card cameras also incorporate a processing system so that the original may be photographed, processed and the resulting aperture card delivered in one combined operation. The card itself may be key punched with data and access information, and devices are available to automatically search and retrieve information. The widest use of aperture cards is in the field of engineering and architectural drawings although they are suited to other types also.

Sheet Microfilm or Microfiche

It is a form of a unitised microfilm; sheet microfilm or flat film is large in size than microfilm which may contain number of pages. Users are generally attracted by the suitability of microfiche as a unit record for documents less than a few hundred pages in length. The development of microfiche standards that have made possible the production of inexpensive, high-quality readers and reader/printers. A microfiche, or 'fiche', is a sheet of transparent sheet of film containing multiple micro images in a grid pattern. It usually contains identification of information, which can be read without magnification. Available in a variety of styles, microfiche generally permit unitized data storage and updating. Microfiche's flat pages are arranged in rows and columns contain from a few to several hundred images in different reduction ranges. A microfiche of standard size is 105mm x 148mm (4"x6") with 98 pages and with various reduction ratios from 18X to 150X. But there are also fiche with 60 frames and as well as on the higher side of 98 pages. Microfiche have the advantage over roll microfilm of being easier to use and to handle, and to identify. They can also be used to produce a microfiche positive print with simple equipment. Microfiche have not been used for single copy reproduction to any great extent, though there does not seem to be any difficulty.

The *Ultra fiche* and *Super fiche* are the terms applied to microfiche produced at high or ultrahigh reduction ratios. Generally speaking the varying reduction ranges are used for distinguishing them by type. For example the Reduction Range 1:1 to 10:1 is for Microfiche, 51:1 to 89:1 is for Superfiche and the 90:1 and above is for the Ultrafiche. The National Micrographic Association defines 'Ultra-fiche' as microfiche at reduction in excess of 90x. The reduction parameters range between 30x and 90x and are termed from medium to high rate. There are even examples of very high reduction up to 150x. The National Cash Register's PCMI Library has microfiche with 3200 images on a 148 x 105 mm size. Ultra fiche permitting thousands of images per fiche offered the advantage of storing (packing) more information in less space than standard microfiche.

Computer Output Microform (COM)

COM is the end product of a process that converts machine-readable, computer-processed digital data to human-readable textual or graphic information on microfilm or microfiche without first creating documents. This is a combination product of computer technology and microphotography. The text stored in computer media can be directly reproduced on film with the help of CRT without creating a paper copy. A simplified account of COM, avoiding the technical complexities, is given here because of its importance in library cataloguing.

The working of a COM recorder is highly sophisticated, but one may think of photographing the picture on the computer's visual display unit on to microfilm, so that the computer's permanent output is microfilm, not typed paper. COM not only saves dramatically on storage space, but it is also useful when multiple copies of output from the computer is needed, e.g. book catalogues. But duplication of microcopy is so cheap that it is possible for a library to have a copy of its COM produced catalogue for each of its service points. The cheapness of the whole procedure is in fact such that frequent updating is feasible: a new COM film merely replaces the old, having had new material inserted by the computer, not by tedious manual filing. The final advantage is of less concern to the librarian using a COM service bureau, but has been claimed to be up to 30 times faster than an impact printer in operation.

COMs are available in 24x, 42x and 48x reduction. They are both in horizontal and vertical modes. The storage capacities of COM's are much higher than normal reduction of 48:1.

Equipments for Copying and Use

The equipments for copying are normally the cameras in the following classes:

- a) The Flow type or Continuous type or Rotary Cameras;
- b) The Flatbed Cameras;

- c) Step and Repeat Cameras for the Microfiche;
- d) In addition to copying there are duplicating equipments which are used in the production of duplicate copies of the microfilms and microfiche.

The equipments for use are (a) Microfilm/fiche Readers, and (b) Reader Printers.

Benefits of Microforms in Libraries

- a) Microforms are a way of preserving information contained in rare documents;
- b) Microform copies are easy to make;
- c) They are less expensive than books;
- d) Microform editions never become out of print;
- e) They are tough and durable;
- f) The temptation to mark, to underline the text, to add marginal notes, is not there;
- g) Microforms save as much as 90% of the space occupied by print media;
- h) Maintaining back volumes is cheaper in microforms, as cost of binding would be nil;
- j) Mutilation and wearing out of often used volumes is eliminated by preserving them in microforms;
- k) Finding volumes and issues is easier as one has to deal with a set of microfiche pertaining to whole collection; and
- l) Cost-benefit analysis of microforms shows much savings in the microform collection development.

The possible disadvantages of microforms are

- a) Although microforms save space, a certain amount of space must be allocated, for the equipment to 'read them';
- b) Users dislike using microforms because they are not easily browsable, and they cannot highlight or make notes in the margins; and
- c) Microforms require machine or device to enlarge them to readable size.

8.5.5 Audio, Visual and Audio-Visual Media

Audio Materials

Audio recordings are one of the first non-print media to be incorporated into the library's collections for specialized information services. Undoubtedly the growth of the audio recording industry has been paralleled by a similar growth in library record collection. The history of audio recording appears to follow two distinct paths (a) Disc recording and (b) Audio tape recording. Generally, the disc recording has always been considerably unalterable, meaning that it cannot be erased or locally recorded, whereas the tape recording allows the end users to erase, modify and record onto the tape. Often librarians proceed to acquire information either on a disc record or on a cassette tape. One soon realizes that audio is truly a dynamic medium. Some academic libraries still possess 78 rpm recordings, open reel audio-tape and there tape cartridge, and these are the prize possessions of many libraries.

Gramophone Records: Charles Cros, a French inventor is recognized as the maker of the first successful disc recording, in 1877. Thomas Alva Edison at about the same time developed a machine in 1885 utilizing the basic concept for all groove disc recordings. He used a needle attached to a device resembling a megaphone and shouted into it the now the famous "Mary had a little lamb". The result was a recording scratched on a foil

covered cylinder. The dents produced on the foil, when played back reproduced the recorded sound. Chichester A Bell and Charles S. Tainter invented the gramophone which used the familiar flat disc for audio recording.

The sound systems have turntables, jewel stylus cartridges, amplifiers and multiple speakers. The term 'Gramophone disc' is used to describe any disc format where an audio signal is recorded as a series of grooves, which are read using a stylus and amplification system. The basic arrangement of gramophone disc has not changed throughout their history. What has changed is the size of the discs, the speed at which they are played and the methods and materials used in their manufacture. The major milestone in audio recording came in 1948, with the introduction of the Long Playing (LP) 45 and $33\frac{1}{3}$ rpm records. LP records were more durable and reproduced sound better than the 78-rpm records. Just 10 years later in 1958, Stereophonic sound became available. In 1972, Denon, a Japanese electronics company, introduced a method to digitally record information onto a master disc. A digital recording supposedly eliminates any vagaries attributable to the electronics responsible for reproducing the audio signal.

Another type of disc is the 'instantaneous recording' disc which consists of a metal substrate, usually aluminum, with a layer of cellulose acetate or cellulose nitrate overlaid on one or both sides. Gramophone discs have recently been all but superseded by the new technology of the compact disc.

Audio Tape

The first machine to use the method of recording on tape was a telegraphone, invented in 1898 by Valdemar Paulsen. The first plastic magnetic tape was developed by German Engineers during World War II. The first audiotape recorders used reel-to-reel audiotapes, where the user had to manually thread the audiotape onto the tape recorder. By 1958 the tape cartridge (developed by the Lear Company) became available, and a few years later audio cassettes (developed by the Philips Company) became the standard for the end user. Audiotapes are made of plastic and coated with a layer of iron oxide or chromium dioxide. The recorder systems used for tape recorders employ much the same electronics as those used for disc recordings. In the late 1980s Digital Audio Tape (DAT) became the latest word in quality recording.

Audio Tapes or Cassettes are packed in cassettes and these require listening equipment. Audio Cassettes operate at a standard speed of $1\frac{7}{8}$ ips (inches per second); cassettes operating at other speeds are for special applications. Recording can be mono-aural, stereophonic, or quadraphonic. The major types of information found on recording are music, storytelling, readings, speeches, recitals, and sound effects. Audio Cassettes are used throughout the world as tools of self-learning, as means for executive training, and as an aid for continuing education. Audio Cassettes are also used in recent years as the most useful teaching medium. These enable the learner to have control over the learning materials. The learner can listen to the cassettes according to his own convenience. It can be stopped at any time. An obvious advantage of the audiocassette over the radio programmes is that they are under the control of the user. Recordable audiocassettes are used by journalists, students and music lovers to record speeches, class lectures, musical events, etc. for listening later. Students can stop the player to take test, make notes or can replay a difficult section. Different purposes for the use of the audiocassettes are:

- a) provide orientation of the course;
- b) clarify certain complex ideas ;
- c) feedback to the student's activities and assignments; and
- d) Summarizes major idea of each unit; and present the views of external experts.

Visual Materials

Filmstrips and Slides: Filmstrips and slides have been a main stay in the library. Basically, filmstrips and slides are identified as being either silent or sound, with the sound being

either as a disc recording or audiotapes. There has been a gradual changing trend away from silent filmstrips and slides toward the sound filmstrip. Computer and video technology are finding their way into the filmstrip and slide medium, making them easier to select and retrieve information in the said medium. This gives the libraries still another option to provide filmstrips and slide information to users. As photographic techniques improved 35-mm film became, and still is, the standard for all-photographic filmstrips and slides. Attempts were made in the 1970's to introduce 16-mm filmstrips and a similar small format for slides.

Slides are a set of pictures and are identified in sets. They are in two categories: (1) Vertical form; (2) Horizontal form. Accordingly, projections are designed to show both types. Similarly, they are produced in two colour forms (a) Black and White; (b) Colour. They can also be produced in two forms : (1) Without Sound Track and (2) With Sound Track.

The advent of the sound filmstrip and sound slide opened a new capability for them. The slide or filmstrip, an individual using a slide or filmstrip viewer can see it, can be projected on a large screen. Still another consideration for using filmstrips and slides is that if the information to be viewed does not require motion, it is far less expensive than a motion picture film. For group presentation, filmstrips and slides can compel attention, generate discussion, and involve follow-up activity, such as reading books for further information. Filmstrips tend to stimulate an interest in the library. A library should spend judicious time perusing filmstrip and slide selection aids to get an idea of the extremely wide range of information available.

The filmstrip is usually 35-mm, and silent filmstrips often have printed captions beneath the frame to explain the picture, even though filmstrips are usually accompanied by notes. Sound film strips are produced by the amalgamation of the strip with records or tapes, often synchronized by a 'beep', signaling that the film strip should be turned on to the next frame. The filmstrip is invaluable as the media of a multimedia programme and is generally a feasible material for inclusion in the libraries. '*Captioned filmstrips*', a variety of filmstrip are best viewed independently. Most utilization of filmstrips and slides in the library will be by individual patrons using a small filmstrip or slide viewer. The librarian needs to be cognizant of the qualities of the sound filmstrip and sound slide, whether it is on actual film or stored on a Video laser disc.

Overhead Transparencies: This is a piece of transparent film available in various thicknesses, commonly ranging from 0.05mm to 0.025mm, either as single flat sheet or as a roll. Different manufactures supply slight variations in their dimensions. Although a transparency is of sufficient size and that it is possible to prepare a visual direct on the material, a copying process is usually included as part of the preparation. Colour can be added to overhead transparencies in several ways; the best options are using the laser printers, or using standard photographic methods. For those in a hurry, Polaroid makes an instant OHP transparency film.

Only specialised libraries dealing with education and training are likely to have these materials to store. Because only instructors normally use them. It is usually kept in any kits to which they refer or store them as a separate collection rather than to make an attempt to inter-shelving them. Overhead transparencies are also extremely compact, and therefore easy to store in suitable boxes, large envelopes, folders or files. Compared with other projected aids, the OHP also has the great advantage that it does not take notes; indeed it can be used in day light situation. It is also 'user friendly', requiring no technical skill or knowledge on the part of the operator.

Audio-Visual Materials

Motion films: Motion picture films on video formats, are important physical media of information. They became very popular as their chief characteristics are a visual image with the combined effects of sound, motion and colour, that is projected onto a screen for large group viewing. In addition to being entertaining, these films are capable of educating,

informing, and testing the viewer. Motion picture film development began in 1894, with its invention by Thomas Edison. The first motion picture films were silent. Sound or talking motion films began in 1927. In the late 1930s colour films made their appearance. At present motion picture films are available in 16mm and 35mm formats.

Motion films that are in video formats are an important part of the library collection. Library film collection has been changing with regard to the film formats being acquired. In the year 1990, 16-mm motion picture films entered as new technology, High Definition Television (HDTV) produces large projection screen quality.

16-mm film serves as a catalyst for small group identification, discussion, persuasion, and reaction. Of all the sound-visual-motion formats, the 16-mm film has the greatest number of titles commercially available to the libraries. Motion films remove the barriers of time, distance, size, and visibility. Motion film has the unique advantage of providing a bird's eye view of the events being depicted. Although the motion film is mostly used in-group situations, it is available for individual use as well. Preparing a film catalogue, which quite frequently is in a book or as a separate computer listing, is an essential tool for the multimedia center staff and the user. Preparing film programs to coincide with special events, holidays, and cultural affairs that affect the community served by the library is also in vogue. Although some users will want to see a film on the library premises, many use it in group situations and want to reserve a film so that it will be available when the group convenes.

Documentary Films: There are many ways to categorize films in the library collection, but it is recommended that they be assigned to three major categories: the feature film, the educational film and the art film, which are called as '*Documentaries*'. The film collection is generally devoted to entertainment, information, and cultural enrichment. The educational films contain a learning objective; it will supplement, or be supplemented by other forms of information media. Of the three types of films- the art film usually are the shortest, ranging from about 5 to 60 minutes of playing time. Subsumed under the categories of feature, educational, and art films are a host of film tapes; history films, science films, cartoons, mystery films, horror films, comedy films, biographical films, and so on. Highly intellectual, thought provoking, creative feature films are sometimes called Art Films by some film critics. These films even win national and international prestigious awards. On the contrary, documentary films are sometimes produced by development agencies and non-government organizations (NGOs) to create mass-awareness on certain social issues as well as to initiate policy formulation or government intervention. Once the decision is made to acquire a film or a particular type of film for the library collection, the next task is to find what films are available in any given category.

Video Tape: Video Tape is used to record programmes in pictures and sound. Video Tapes have literally taken over the entertainment world from the cinema. Video Tapes store magnetic signals for simultaneous subsequent retrieval of the visual and the audio information components. Lectures by experts, demonstration of processes, techniques, and field trips of inaccessible/remote regions could be recorded on videotapes for subsequent use. Video Tape is a very useful innovation, which removes the constraint of viewing programmes at a fixed time. These tapes are like films and have the same impact as the film. The audience for a film is larger than video tapes, and the tapes can be seen on a television screen. While films are costly to make, video tapes are comparatively cheaper to make.

There are some media forms in a library that cannot be conveniently categorized as purely audio, visual, or audiovisual. These media forms, because of their size, shape and presentation of information content, are acquired here. Such forms are models, realia, and games and simulations.

- 5) State the advent and need for the study of non-print media.
- 6) Write a short note on microforms.
- 7) Explain in brief the Audio-Visual media.

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

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

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8.6 ELECTRONIC MEDIA

The electronic media is used for the storage, distribution, and transmission of information in electronic form. It includes magnetic, optical, digital, and magneto-optical media. This has been growing worldwide accruing advantages for electronic publishing.

8.6.1 Magnetic Media

The Magnetic Media is a secondary storage or external storage and used as mass storage device. The Internet backed up information is largely in magnetic media, and it is being one of the main utilities as mass storage media. There has been most astonishing developments in this Media. Magnetic media consists of -

- a) Magnetic Tape; b) Magnetic Drum; and c) Magnetic Disc.

a) Magnetic Tape

Magnetic tape was introduced in 1950s as a data storage medium or as an auxiliary or secondary storage medium for the mainframe computers and later in mini computers. For three decades, magnetic tape was used as secondary storage. By mid-1960s magnetic drum and magnetic disc devices arrived into augment the tape units in mainframe systems designed for scientific and business data processing applications. The main use of magnetic tape was for archives and back-up files.

Data on the magnetic tape are stored as tiny invisible magnetized spots on an iron oxide thin film polymer (MYLAR) material coated with Acetate or Ferrous Chromium Oxide on one side of the tape. The stored data can be read many times and can be preserved for years or until erased by the recording of new data. Magnetic tapes have a high storage density (ranging 800 bytes or characters per inch (BPI) to over 6,000 BPI). Thus, it is possible to store over 100 million characters on a single 10.5 inch reel of tape. The cost per bit stored is obviously very small. Some features of Magnetic Tape are :

- i) *Unlimited length of records:* Any number of characters can be placed in a magnetic tape record. Sequentially organised files can be accommodated as long as necessary;
- ii) *High data density:* A typical of 1.5 inch reel of magnetic tape is of 2,400 feet long and is able to hold 800, 1600 or 6250 characters per inch. (The actual number of

characters per inch depends on the tape drive used). Thus, if 6250 characters are held in each inch of tape, and if the tape is 28,800 inch long, then the maximum capacity of the tape is 180 million characters;

- iii) *Low cost and ease of handling:* A 1-1.5 inch reel of tape costs less than \$20. Additional cost benefit is that tape can be erased and reused many times. The tape would be easy to carry due to its compact size and light weight; and
- iv) *Rapid transfer rate:* Compared to Punched cards or Punched Paper tape the magnetic tape had many advantages. Some of the limitations of Magnetic Tape are - lack of direct access to records. Magnetic tape is a medium which is ideally suited to batch processing applications which must read all the data on the tape for it to be processed; it is used for the entire tape to be read and processed to update the sequentially organized records in the file. If frequent access to file records is needed on a rapid and random basis, then magnetic tape is not the best medium.

Although in theory magnetic tape has high storage density, in practice, physical records on magnetic tape need to be separated from each other by inter-record gaps. Such gaps can occupy a large portion of the tape, reducing its effective capacity. It is usual, therefore, in using magnetic tapes to make blocks of several logical records to enable better utilization of tape space. Each block gets separated from the adjoining one by the inter block gap.

Usages: Though magnetic tapes have gone out of use today, but it had been the main physical storage media for archival storage and security of data. The magnetic tapes are used as back-up data in files that were stored on hard discs. Magnetic tapes are also used as a medium for the distribution of bibliographic databases and update them. The library networks and other organisations used magnetic tape to distribute catalogue records to member libraries and such records were used in the member libraries to update their on-line catalogues.

Magnetic discs were used for storage and transmission of information electronically rather than a physical distribution. It is still used for the archival storage. In many cases it is also used as supplement to print media viz. for books and periodicals.

b) **Magnetic Drum:** Magnetic drum, conceptually, is similar to Magnetic Disc, with a rotating cylinder coated with ferromagnetic material. The drum rotates at a very high speed. Reading and writing heads are mounted on the drum for Bands and Groups. The diameter of the drum ranged from 3" to 24" with several hundred channels. Binary digits are stored on its surface in the form of magnetized sub-regions. Magnetic drum is no longer in use.

c) **Magnetic Disc:** Magnetic disc technology was almost simultaneously introduced with magnetic tape as a secondary data storage media in 1960s. Magnetic disc, now, has replaced the magnetic tape. From the beginning it is also used as a secondary storage media in mainframe and mini computers. Gradually the storage density, and the comparative cost per bit stored on magnetic disc came down considerably.

A magnetic disc is a flat, circular, metal or plastic plate coated on both sides with iron oxide, or other readily magnetizable material. The data are recorded on the surface of the disc as magnetic patterns in circular tracks divided into units called sectors, by a recording head, while the disc is rotated in a drive unit. The heads that are also used to read the magnetised data, can be positioned anywhere on the disc with great precision.

The two types of Magnetic discs are : **Hard Disc** and the **Floppy Disc**.

The hard disc can be further divided as **Disc Pack**, and the **Winchester Disc**. The Disc Pack used in mainframes and mini computers is mounted vertically on the spindle of a drive unit, which is equipped with multiple reading/writing heads. The Winchester disc, a part of microcomputer, is not replaceable and it is enclosed in a sealed pack. However, method of recording and storing data on both the discs is same. The disc packs are

available in different diameters and a pack may contain 5-11 or more discs, and coated with magnetic material on both sides for recording. The Disc packs can be easily replaced and the recording and replacing of data on discs and tapes is identical.

d) Floppy Disc: Small, flexible plastic discs, were developed in the 1970s. Floppy discs derive their name from the recording media itself, which is an oxide-coated flexible disc enclosed within a protective plastic envelope. The read/write head is mounted on a carriage that moves on the read/write area in the floppy disc. The floppy discs were employed in Mini Computers (8" Diameter) and later 5.25" diameter floppy discs were introduced in 1980s to be used in Microcomputers and were replaced with Mini-diskettes of 3.5" diameter. The capacity range from 360KB to 2 MB in 3.5" floppy discs. The floppy discs were used for temporary storage and were issued also as supplements to books and other documents for the bulk data, like computer programmes. The cost of floppy discs has also come down considerably. The advent of polyester based compact disc technology, with read-write and rewrite facilities available with compact discs, and the prices of the CD- Read-Write drives and devices coming down considerably, the Floppy disc is now gradually being replaced by the Compact Disc.

e) Pen Drive: A pen drive is a small removable data storage device that uses flash memory and USB connector. Pen drive is also known as keydrive, USB flash drive, micro hard drive. It can store data in large amount (64 MB, 128 MB, 256 MB, 512 MB, 1 GB and so on).

Self Check Exercises

8) What are the forms of electronic media?

9) Write a short note on Magnetic Media.

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

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

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8.6.2 Optical Media

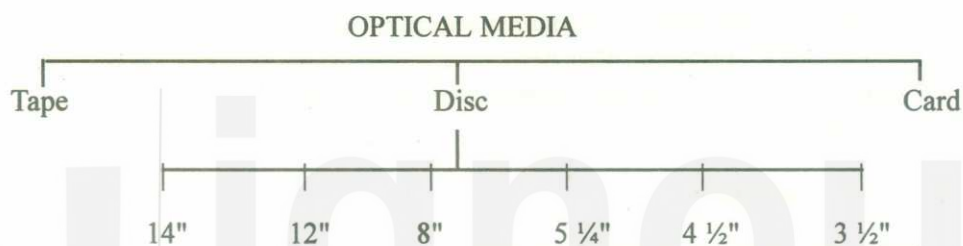
The Compact Disc or Optical Disc is a household word worldwide. Even in India, it has become well known. It has become increasingly important as a medium for the storage and dissemination of information during 1990s. But Compact Disc or CD-Audio known generally is the only one member of the family of optical storage media which includes various important and diverse devices. Optical media, besides having revolutionized musical storage has a very significant impact on data storage, for libraries, government, industries and business organisations throughout the world. The first optical video disc system was pioneered by Philips with their Laser Vision system, but Sony, 3M and other are now very active in this area. The two directional changes in IT from Microelectronics to Opto-electronics provided necessary facilities for creating mass storage devices like the Optical Storage systems—Compact Disc System. In this context compact disc read only memory or popularly known as CD-ROM is one of the most popular of the optical

storage media and is being used as a mass storage device, primarily in libraries. Started as a musical disc device, it is now being used as a media for computerised reference and full-text databases, dictionaries, encyclopaedias, directories and the primary journals. Some of the most outstanding and apparently distinct advantages of optical storage devices over magnetic storage devices (discussed later) have made the compact disc storage media more attractive and popular in recent years. In this context it has posed a challenge to the printed book. Today compact disc is a household name in the world of computers and communication systems.

Classification of Optical Storage Systems

In any optical material the basic principle of storing/recording information is by altering its optical property, by selective exposure to light. The read write mechanism and playing systems are similar for all the optical systems. Basically, there are two classes of optical storage systems :

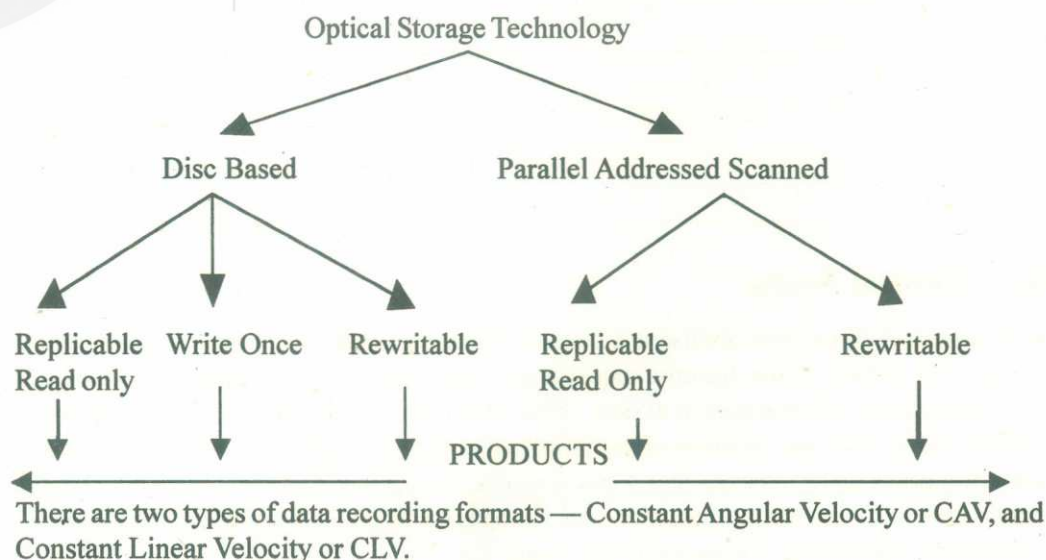
i) Classification by shape and size of the media



Examples:

- 1) 12" or 8" was the earliest to be developed for computer storage.
- 2) 5 1/4" was the most popular till recently for computer storage.
- 3) 4 3/4" compact disc audio and compact disc read only memory (CD-ROM).
- 4) 3 1/2" Erasable magneto-optical (TMO).

ii) By recording technology or by the data recording format.



CAV disc rotates at a fixed speed and data is also written at fixed rate. Spacing between signal elements increases as the track radius increases (MCAV).

CLV avoids the limitations of CAV. The rotation speed varies according to radius and signal spacing same as per every track (MCLV).

Categories of Compact Discs: Brief account of different categories of compact discs is given below:

**Print and Non-Print
Media**

Read-Only: It is mainly used for entertainment and computer storage.

Laser (Video) Disc: This category consists of CD-Audio, CD-I, CD-ROM used in electronic publishing, data storage, etc.

i) CD-Audio: The music CDs play music with Window's Media Player, although typically you would use the software that comes with the CD-ROM drive. Designed as high quality alternative to records and cassettes, compact discs are all made to a standard specification (12 cm) developed by Philips. The audio information is digitally recorded (by converting the amplitude of the sampling frequency of 440,000 per second) before production of a master CD. It is copied in much the same way as for videodiscs. Playback involves a reflective laser system and a digital-to-analogue conversion step. A sophisticated error correction and detection system developed by Philips and Sony ensures the accuracy of the recorded signal and the information stored on a typical 60 minute, 12-cm. disc amounts to 5-gigabits.

ii) CD-I: Compact Disc Interactive, developed by Philips/Sony, includes audio, full screen video and interactive capabilities.

iii) CD-ROM: Compact Disc Read-Only Memory - one of the most extensively used format is now a main compact storage device for text and non-textual information of current as well as archival information. It is very popular among magazine publishers. It is a simplest electronic form for storing print information on a small laser disc. CD-ROM requires the interfacing of a CD-ROM driver with a microcomputer. CD-ROM discs have silvered surfaces, which are 1.2 mm thick and 12 cm in diameter. CD-ROM can be used with virtually any size of computers - with stand-alone and/or in networked servers and jukeboxes. It offers the opportunity to develop new applications software as well as the distribution of many versions of the same computer software programs. A single CD-ROM disc can be used to distribute a family of software applications with fully interactive tutorial and menu-driven functions. CD-ROM represents an exciting breakthrough in information storage technology. It is a new publishing medium, and an educational tool of unprecedented power. It is also used to store entire database and by using keywords or descriptors, data can be quickly searched and located, thus saving many hours of tedious searching through indexes for any particular information in printed form. The benefits are: libraries can have economic access to information, a large quantity of information is stored on a small disc, (can hold 200,000 pages of printed text). CDROM database is found to be cost-effective than the Online Systems. Other information distribution applications that may use CD-ROM, include on-demand research reports, and product information. In addition, computer databases, archives, indexes, and directories can be distributed on CD-ROM. All information distribution applications are finding a niche in professional and commercial environments and eventually finding their way into homes as ideal for the storage of images.

The CD-ROM's digital format, with powerful error correction, is well suited to computer applications. With optical-read-out, the high-density information on the disc is protected from wear and deterioration. It is highly resistant to damage, and there is no risk of disc crashes like magnetic media. There are some disadvantages too. As the name implies, the duplicated discs are read only; data cannot be written on them. The information on discs cannot be as current as it is possible with an online retrieval system using magnetic storage and access time as compared with magnetic discs is slow. Unlike storing journals or books, an initial investment is required to purchase hardware, furniture, electrical connections, and software to set up workstations.

Characteristics of CD-ROM

Minimum data transfer rate from the CD-ROM drive to the host computer is of 153 kilobytes per second with a nominal data transfer rate of 176 kilobytes per second. The rotating speed of CD-ROM disc is anywhere between 200 rpm at the disc's outer rim

and 530 rpm at the disc's inner track. Access time varies anywhere from about one-half second to two seconds. The potentiality of the CD-ROM lies in its compactness (12 cm & .2 mm thickness), portability, reduced shelf space, maintenance cost and durability. The exciting features of CD-ROM are its ability to handle and play a wide variety of material viz. books, periodicals, directories, education materials, games, music, movies, animation graphics, software, sound, text, and video. A readily available disc can hold more than 660 MB of information, which is equivalent to 440 Floppy discs of 1.44 MB capacity, 18 hours of sound and up to 700 million characteristics of text and up to 74 minutes of movies or the video. The total number of blocks on each disk is 270K and each block size is 2K bytes (2048 bytes). Both CD-ROM discs and digital audio compact discs). These days 700 MB storage capacity CD-ROM is also available.

Write Once Read Many (WORM)

In WORM or DRAW (Direct Read After Write) computer data storage, archival and backup storage, handwritten macros, signatures, drawings with 1,000,000 to 1 million images of data can be stored on a single disc. Write Once Read Many are very high capacity discs where users can input original data in order to create their own CD discs. Unlike magnetic discs, write once discs cannot be erased and rewritten in whole or in part. Users continue to record sections of data onto the disc over a period of months or even years, until the disc is full. But it is not possible to over-write data onto an already written section or to erase anything once recorded. Another type of write once disc is called DRAW for "direct read after write". This allows the data in a block to be checked for accuracy as they are being written. In practice the WORM systems are costly but ideal for specific, major corporate applications as storage media.

Generally WORM optical discs are best for high access or quick retrieval applications that do not require open-ended intention. Archival storage on WORM optical discs is the most cost-effective alternative for a growing number of information management environments. Film-based storage remains the alternative of choice for high volume, low retrieval applications, where records are permanently stored. However, in situations where access to stored products is frequent, where quick retrieval is necessary or where records can be purged after several years, WORM often provides the most efficient solution at the lowest cost. In addition to fast retrieval, WORM discs provide fast turnaround, increased security over magnetic disc storage and enormous space efficiencies over both magnetic and paper media.

CD-ReWritable (CD-RW)

An erasable CD-ROM called CD-RW or CD-Re-Writable is comparatively new technology and has an erasable CDs, and a flexible new storage solution for mass storage, holding 500 times more data than a typical floppy. They appeared in 1997 and are being used in the current CD Drives. CD-RW technology is different from the CD-Recordable (CD-R) technology which can be recorded on only once.

Re-Writable Magneto-Optical Discs

The ever increasing memory capacity of computers has made it imperative for storage media to keep pace. The ability to read, write and erase at will has been realized in re-writable magneto-optic discs. Emerging magneto-optic technology has opened up exciting possibilities in this sphere, sometimes called removable 'Winchester' devices and can be used for on-line as well as off-line, back-up and data-distribution applications. Since the coercive force to flip a bit is very high at room temperature, there is very little chance of erasing data accidentally.

Magneto-optic technology combines the erasability of conventional magnetic storage devices with ultrahigh capacity, non-contact, no head crash and removability features associated with optical storage devices. In magneto-optic devices, a laser beam is used to read, write and erase magnetic information. The write/erase mechanism of magneto-optic system is based on a thermo-magnetic process whereas reading data is based on the magneto-optic phenomenon called Kerr effect.

CD-R is used for backup, archive, catalogues and other large documents and multimedia.

Production of CD: A Boon to Publishing

The process of making a CD-ROM starts first with a magnetically stored data which is prepared according to the manufacturing facility of pre-mastering specifications. A glass master disc and a set of metal stampers which 'stamp out' the replica discs are created. The disc manufacturing environment requires a rigorous set of clean room requirements, since the disc attracted dust particles. The disc made of a very brief injection moulding of polycarbonate material, to which a centre hole of the disc is made, prior to the disc's removal from the hold. The accuracy required during the storing of data (the laser must be focused to a diameter of 0.5 micron and must follow tracks only 1-5 microns apart) means that it is an expensive process with high wastage, particularly when digital data, rather than (less sensitive) pictures and sound, are being recorded. Once the files of documents have been completely processed through the stages of scanning, indexing, quality control, and rescanning (if necessary), quality controllers mark them ready for final recording. This was the traditional industry based CD-ROM mastering and replication method. This is used as a cost effective method of producing CDs in publishing as large volumes of discs were required to be produced.

The need for quick and in house production of CD was felt as the demand for Electronic Publishing grew. The publication activity on CD was found more economical for distribution with the addition of desktop publishing and web publishing. In print it was 'Print and Distribute' and now it is 'Distribute and Print' resulting from Web and CD publishing. These factors gave rise to a need for in house CD production and CD recording provided an effective solution to all these needs. Till late 1980s CDs were produced only in mastering and replication process, which was expensive to set-up. Beginning with 1990s CD-R Recordable were made available and CD Writers came into use which proved very cost effective and could be used by individuals too. Like in magnetic media, in CD Read-Write, drives are together and came into use. This made it possible to write or record as well read a CD incrementally and which can go more than one recording processes. The writable CD and CD-Writers together in use came as a master production from which additional copies can be reproduced. Thus, CD production has now become an in-house process since the beginning of 1990s. The cost of CD Writers has also come down to as low as Rs.2000. This can be compared to cost of first CD Writer which was sold in US for \$0.15 million. It burned CDs at 1x speed and was used to write only audio CDs and for data CDs additional accessories worth \$14,000 were needed. But today a CD writer uses a HD with a software for Reading and Writing at a much less cost. This made the CD Publishing a household activity.

CD-ROM and Libraries

Use of CD-ROM in libraries has come as a great solution for storage of databases, Full Text Journals, Reference Books and Multimedia products. The categories of databases made available on CD-ROM are:

- a) Bibliographic Databases – the Reference Databases of Indexing and Abstracting Periodicals.
- b) Trade Catalogues of Products, Book Sellers and Publishers.
- c) Source Databases of Full Text Journals and Standards.
- d) Source Databases of Quick reference - Reference books like Dictionaries and Encyclopaedias.
- e) Hybrid Disc – Like the Dialog on Disc.
- f) Multimedia Products and Databases in the form of CD-I and CDTV.

Self Check Exercises

- 10) What are the categories of optical media?
- 11) Write a short note on Compact Disc- Read Only Memory(CD-ROM)
- 12) Examine the application of Compact disc in Libraries.

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

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

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8.6.3 Digital Versatile Disc (DVD)

DVD—the Digital Versatile Disc, initially known as Digital Video Disc is a high capacity CD-size disc for data, video, multimedia, games and audio applications. Capacities for the read-only disc range from 4.7GB to 17.1GB on a 12cm disc with a throughput equivalent to 12-speed CD-ROM drive. DVD adopts a ‘one-size fits all’ types of a philosophy allowing storage of home entertainment, computer and business information with a single digital format. The high quality of video and audio has helped DVD-Video to replace VHS for pre-recorded titles and to increase the overall video market in most regions. The general term DVD actually subsumes two types — DVD-Video and DVD-ROM.

DVD History:

DVD started in 1994 as two competing formats—Super Disc (SD) and Multimedia CD (MMCD). DVD now is the result of an agreement by both camps on a single standard to meet the requirements of all the various industries involved.

Table 8.2: History of DVD

Year	EVENT
1994	Hollywood Ad-hoc Committee defined features for movies on a ‘compact disc’.
1995	Philips/Sony announced and demonstrated MMCD . Toshiba & Warner announce and demonstrate SD . Agreement is reached on a single standard format called DVD that combines the best of MMCD and SD.
1996	DVD-ROM and DVD-Video specifications version 1.0 published. Digital copy protection scheme (CSS) agreed. First DVD-Video players sold in Tokyo (Nov).
1997	Launch of DVD in USA (Aug). DVD Consortium becomes DVD Forum, expands membership and holds first General DVD Forum Meeting with 120 members.
1998	DVD-Video version 1.1 and DVD-ROM version 1.01 specifications released.

	DVD Forum adopts DVD-RW. DVD Forum announces 7 new members of DVD steering committee making 17 in all. DVD Forum publishes DVD-Audio (version 0.9) specification.
	Full launch of DVD in Europe. 1m DVD-Video players sold in USA. 4.7 GB DVD-R and DVD-RAM version 1.9 specifications released.
1999	DVD-Audio (1.0), DVD-Video Recording (0.9 & 1.0), DVD-RW (0.9) and DVD-RAM (2.0) specifications published.
2000	CPPM copy protection for DVD-Audio agreed. DVD-Audio players launched in USA (Jul). First DVD-Audio discs in USA (Nov).
	DVD-RW Part 2 (1.0), DVD-R for Authoring (2.0), DVD-R for General (2.0) and DVD Stream Recording (0.9) specifications published.
2001	DVD-Audio players & discs available. DVD Video Recorders launched in Europe etc
	DVD-Multi (1.0), DVD Stream Recording (1.0), DVD-Audio (1.2) & DVD-Video Recording (1.1) specifications published. Guidelines for IEEE 1394 transmission for DVD-Video/Audio issued.
2002	WG-11 created to study future blue laser format(s) DVD-Audio recording specification ver 0.9 issued. Hybrid DVD-Audio format considered by DVD Forum.
2003	DVD Forum rejects hybrid DVD-Audio format.
	DVD Forum releases iDVD specifications to provide enhanced interactivity for DVD-Video.
	DVD Forum approves HD DVD version 0.9 specification and adds three new members to the Steering Committee.

DVD Formats and Media:

DVD disc vary in capacity, application, and storage format. It is important to know the formats and media. There are : a) Physical Formats; b) Formats for DVD Applications; and c) Formats for Data storage.

a) *Physical Formats* : Physical formats are based on the physical characteristics of DVD discs. The following four types of physical DVD disc formats are available.

DVD-5 : Is a single sided, single-layered DVD with 4.7 GB storage capability.

DVD-9 : It is also single sided but dual-layered with 8.5GB storage capability.

DVD-10: Is double sided, single layered with 9.4 GB storage capability.

DVD-18: Is double sided, double layered with 17 GB storage capability.

b) *Application Formats* : The physical formats describe the media on which the data is stored, and application formats describe what kind of data- software, video or music, is stored and how. These include:

DVD-Audio: Provides higher quality audio storage that what is available for CDs.

DVD-Video: It has capability to produce near-studio-quality video using high-quality MPEG-2 Video compression.

Data DVDs : A DVD disc can also be used for storing ordinary data from a computer, such as printed documents.

c) *Writable Formats or Formats for Data Storage:* The physical application formats as listed above, tell the physical characteristics of a disc and the type of data stored on it. The writable formats define the different ways in which data is written to and read from the DVD disc, be it audio, video or computer data. Like in Compact Disc, there are several formats in DVD category such as DVD-ROM, DVD-RW, etc.

DVD Features :

The main features of the DVD formats are:

- Backwards compatibility with current CD media. All DVD hardware will play audio CDs and CD-ROMs (although not all hardware play CD-Rs or CD-RWs).
- Physical dimensions are identical to compact disc but using two 0.6 mm thick substrates, bonded together.
- Single-layer/dual-layer and single/double sided options.
- Up to 4.7 GB read-only capacity per layer, 8.5 GB per side maximum.
- Designed from the outset for video, audio and multimedia, not just audio.
- All formats use a common file system (UDF).
- Digital and analog copy protection for DVD-Video and DVD-Audio built into standard.
- Recordable and re-writable versions are part of the family.

DVD-Video Requirements: The Hollywood based Motion Picture Studio Advisory Committee defined the following requirements for the DVD-Video format:

- 135 minutes on one side of a single disc (covering 99% of all movies).
- Video resolution better than Laserdisc (LD).
- CD quality surround sound for true home cinema listening.
- 3 to 5 languages (audio) per title on one disc.
- 4 to 6 subtitles per title on one disc.
- Pan-scan, letterbox and widescreen formats.
- Parental lock features.
- Copy protection.
- Compatibility with existing CDs.
- Chapter division and access (like Video CD).
- Manufacturing cost similar to current CD costs.

The **Video CD** format was studied, but was rejected as it could not offer the necessary combination of quality and playing time, hence the need for a new higher capacity disc format has been realised in DVD. The above requirements have all been met in the DVD-Video specification. Most DVD-Videos also include extras that cannot be included on a VHS, such as biographies, director's commentary, making of the movie, etc. An increasing number include DVD-ROM content, which can range from links to relevant websites to a full game based on the movie. The use of websites can allow the disc to be used in different ways with updated text and graphics information on the website complementing the video on the disc. The DVD-Video specification is based on a pre-recorded DVD (DVD-ROM) with **UDF Bridge** file system. A DVD-Video can therefore be a DVD-5, DVD-10 or DVD-9 disc depending on the playing time required and other factors.

Though DVD-Video can provide audio, video, stills and navigation DVD—Audio format is needed. However, while DVD-Video offers multi-channel LPCM audio, the available bit rate is only 6.144 Mb/s compared with DVD-Audio's 9.6Mb/s, which is further enhanced by MLP to offer the maximum sampling rate and quantisation with maximum playing time. DVD-Audio is also designed to play in audio-only players (such as in-car players) and offers slideshows and text that are optimised for audio. Finally DVD-Audio offers CPPM, which is much stronger than CSS for DVD-Video. These differences are summarised in the table below.

Table 8.3: DVD-Audio vs. DVD-Video

Feature	DVD-Audio	DVD-Video	Comments
Audio bit rate	9.6Mb/s	6.144Mb/s	DVD-Audio allows higher quality
MLP compression	YES	NO	For higher quality & playing time
For audio-only players	YES	NO	Important for mobile players
Copy protection	Good	Poor	Required by content owners

8.6.4 Beyond DVD

Blu-Ray

The Blu-Ray format is being developed by the Blu-ray Founders Group comprising the following companies - Hitachi, LG, Matsushita, Pioneer, Philips, Samsung, Sharp, Sony, and Thomson. Mitsubishi joined the group in 2003 and Dell and HP have recently announced their support. Blu-ray discs offer a capacity of up to 27 GB per layer. This is achieved by the use of a blue laser at 405 nm wavelength, an increase in numerical aperture to 0.85 and a reduction in the cover layer from 0.6 mm for DVD to 0.1 mm. However, this presents significant manufacturing problems and requires new mastering and replication equipment and processes.

Sony has already launched a Blu-ray recorder aimed specifically at the Japanese market for recording HD video from the Japanese HDTV satellite broadcasts. 23 GB single layer rewritable media are also available. Product launches of Blu-ray products in the USA will probably not happen until 2006 with any European launch being later.

A pre-recorded version (called BD-ROM) is also under development, but it is not yet clear whether this will offer a full 27 GB capacity.

HD – DVD

An alternative version of DVD has been developed by Toshiba and NEC and a provisional specification approved by the DVD Forum. The original name was AOD (Advanced Optical Disc).

There are three versions in development -

- HD DVD-ROM discs are pre-recorded and offer a capacity of 15 GB per layer per side. These can be used for distributing HD movies.
- HD DVD-RW discs are re-writable and can be used to record 20 GB per side for re-writable versions.
- HD DVD-R discs are write-once recordable discs : capacity of 15GB per side.

Like Blu-ray discs they need a blue laser of 405nm wavelength, but are physically similar to DVD discs, as they use a cover layer of 0.6 mm. Therefore HD

DVD discs can be manufactured using existing DVD lines, and existing UV mastering equipment.

8.6.5 Comparison of Three Formats

The following table provides a comparison of the two formats and DVD. It is not yet clear which format will win. Blu-ray currently seems to have the most support, but HD DVD presents fewer manufacturing problems, particularly for pre-recorded versions. HD DVD can be mastered and replicated with current equipment, while Blu-ray requires new equipment and processes for both. The following table summarises the differences between the pre-recorded formats DVD, HD DVD-ROM and BD-ROM.

Table 8.4 Comparison of Formats

Parameters	DVD	BD-ROM	HD DVD -ROM
Capacity per layer (GB)	4.7	25	15
Disc thickness (mm)	0.6 + 0.6	1.1 + 0.1	0.6 + 0.6
Laser wavelength (nm)	650	405	405
Numerical aperture	0.60	0.85	0.65
Cartridge	No	-	No
Tilt control needed	No	-	Yes
Complexity to read DVD also	-	More complex	OK

8.7 MULTIMEDIA

Multimedia has become one of the often referred to media in education, culture, and for the learning process. It has become one of the highly influential applications in every sector of personal, professional, and business environment. It is imperative that in the present context every one is aware of multimedia, especially libraries the impact on which has been highly revolutionary. It has transformed the whole image of a printed book — from a physical object to a virtual media. Today, we think of any product in the form of illustrative materials or learning kits or, particularly, reference book in the library—all are widely available in multimedia format.

8.7.1 GENESIS

The art and science of multimedia is not only a marvel of integration of computer and optical storage media, but also, the parallel developments in the fields as diverse as art, film, television, telecommunication, digital optical storage, psychology and of course computer science. During the four decades of its development phase from 1945-1985, number of visionary thinkers, artists, writers, computer scientists have contributed to its present realization. The team headed by Vennever Bush, includes others like, Ted Nelson, Alan Kay and Douglas Engelbart, who have been chiefly responsible for the conception, architecturing and bringing into a world of virtual reality, which the mankind had never thought except in some Indian mythological stories.

The major steps in this media fusion process and developments were, starting with telephone and telegraph networks and cinematography in the 19th Century, the inventions of television in the 1930s, the digital computer in the 1940s and 1950s, and the emergence of personal computer in 1970s. It was the convergence of these technologies in the late 1970s and early 1980s that finally provided the framework for consumer usable interactive multimedia.

Combining still and moving images, sound, text and interactivity, is the multimedia in the sense, has initially culminated in a new way of communication of information using computers. To repeat again it is the convergence of computer, digital video, digital audio and sound synthesis. The media on which multimedia is held are CD-ROM, CD-I, and CD-A and so on.

8.7.2 Defining Multimedia

Multimedia, in its initial years, was somewhat confusing and inadequately defined — meaning different things to different people. Libraries especially had a different connotation of the term multimedia. Although, explanation can be provided to clarify the meaning of the term, but it is difficult to provide an acceptable definition of the term to all. By definition, multimedia has two contexts. In the context of earlier libraries, a multimedia referred rather to a variety of media possessed and held by libraries such as illustrative materials — maps, atlases and globes, audio, visual and audio-visual materials like the sound recordings, charts, microforms, and the motion, documentary and educational films.

But in the present technological context it is a single product enabling computational facility, integrating or combining sound, animation, graphics, text and displaying them all at once. It is a seamless integration of data, text, images and sound within a single digital information environment. Technical multimedia can also be oversimplified. It represents the convergence between Computers, Digital Video, Digital Audio and Sound synthesis.

A simple definition of multimedia is that it is a generic term for 'multimedia computing' or 'interactive multimedia': the use of a wide variety of media within a computer interface or hypermedia programme. Also, it was used to describe art works that combined several different media.

A new British magazine 'Multimedia computing with sound and motion' published in 1990, in its first editorial, suggested, "multimedia is all things to all people". The name can convey a highly *specific meaning or less than nothing* depending on your audience. In fact, multimedia is a singular mix of disparate technologies with overlapping applications in pursuit of a market and an identity.

In 1990, the journal Byte published a special feature on multimedia. It was a detailed one. But, it seemed to flounder whenever it attempted to pin multimedia down with a rigorous definition, it only offered the following:

Even if you are not sure what multimedia is, you probably know it when you see it (or hear it).

In other words, if the meaning of the word is to be discovered from its usage, then multimedia means the processing of *information derived from or present in several different media*. The second edition of OED describes multimedia as 'design pertaining to a form of artistic, educational or commercial communication in which more than one medium is used.

Today, computer science and technology provides a single medium with the power to integrate diverse types of information. Therefore, the first stage of identifying *modern multimedia* is to focus on *its power to draw together* different forms of communication, smoothly integrating them within a digital environment and providing access to the stored information using computer systems which are fast, friendly, and interactive.

This calls for four important factors in all multimedia system. First, they need very large memory space, second, specialized and powerful processing technology which is essential to handle retrieval, processing and display of the large volumes of information. Third, in addition to text and numeric, output and display architecture have to be capable of delivering both sound and images according to the required standards of any given application.

Fourth, the rich and complex environment becomes useless. Users can easily find their way around it, locating and accessing the information that they require. The above-mentioned factors determine the character of successful *multimedia platforms*. The publicity that multimedia is receiving today indicates that the technological capability is very much available and it is only the human design skills are needed to put the technology to work and create powerful applications that requires to be developed.

8.7.3 Need and Purpose of Multimedia

It may be stated that multimedia is aimed at satisfying the demand for '*better access to and presentation of information*'. The uniqueness of multimedia may be stated as its ability to present rapidly a variety and quality of information to meet the varied needs of different users. In the present environment, selection of crucial data is a difficult task. It calls for extensive preparation. In any effective communication user comprehension is of utmost importance. The application of multimedia will certainly solve the problem of presenting quickly and effectively the right kind of information to a variety of users.

Multimedia has provided better access to and for the presentation of information in almost virtual form. The term virtual reality has almost been synonymous to multimedia. The unique feature of multimedia is its ability to present rapidly a variety of information to meet the varied needs of different types of libraries and /or users. In libraries user satisfaction and effective communication of information is primary and multimedia certainly fulfills this need effectively. Multimedia has certainly solved many problems of presenting quickly and effectively a variety of information in different forms. It is being effectively utilized in applications in education and training, business and professional applications, book trade and publishing apart from commercial applications. Multimedia application delivery is through hypermedia and/or hypertext which is covered in next section of this Unit.

8.8 HYPERTEXT AND HYPERMEDIA

As stated above, the technologies involved in the delivery of Multimedia information is through the hypermedia and/or hypertext methods. The word Hypermedia is so much linked with multimedia that some times it is used as a synonym for multimedia. The term hypermedia is generally used to refer to information containing high proportion of graphics and images and is almost always used, where the information also includes video sequences or any form of animated information. Let us first understand what is hypertext and hypermedia.

8.8.1 Meaning and Definition

Simply stated, hypertext consists of nodes (or chunks) of information and links between them. According to glossary of multimedia, Hypertext is "Text which allows user to 'hyper-jump'. Hypertext is basically same as regular text, with one exception: Hypertext contains connections within the text to other Web documents. The rationale behind the development of hypertext was a simple one - to optimise the processes of writing, storing textual information, and accessing that information. The connections are denoted, generally, as underlined, coloured text. The 'documents' to which the hypertext connect may be local, remote, or perhaps even in different location. The hypertext is a software tool that enables the user to read texts linked in a variety of linear and non-linear ways and to create new links between words or passages of text. Stated thus, it is easy to find early examples of hypertext - any text with references to another can be seen as two nodes of information with the reference forming the link, any text which uses footnotes can be seen as containing nodes of information (the text and footnote), with the footnote marker providing the link or pointer from one node to the other. The idea of a node is very general, and there are no rules about the size of a node (how big a node should be) or what it should contain. Similarly, there are no rules governing what gets linked to what. What makes hypertext different, and sets it apart from the most conceptually inter-linked

paper document, is that in hypertext the links are '*machine supported*'. When a reader selects a hypertext link, the movement between two nodes takes place automatically. It is for this reason that the advent of hypertext had to wait for the combination of processing power and display embodied in the modern computer.

It may be noted that the concepts of *node* and *link* are rather flexible. A node of information can be a piece of text, fragment of music, a map, a complete film anything which the author thinks can sensibly be presented as a unit. Even if a particular hypertext system always displays one screenful of information at a time, a node can consist of several consecutive screens. Similarly, a link is arbitrary in the sense that there are no rules to determine where a link shall be made. A link can be made between any two nodes which the author considers to be connected in some way. In some hypertext systems, there are several types of links and the author should specify which type he would like to use.

Hypermedia, on the other hand, is 'hypertext' with links not only to text, but also to other forms of media – sounds, graphics, movies, video, animation and so on. Hypermedia consists of hypertext combined with still or moving images and sound. Unfortunately, 'hypermedia' and 'hypertext' are two more terms that may be wrongly interchanged. Strictly speaking, hypertext relies on text only. A technical definition of Hypermedia is "Interactive programmes in which information is stored in a number of different media and organised so that it can be retrieved and presented in a variety of ways that amplify meaning for the user". Hypermedia involves the presentation of information in media that most effectively communicate its content, and provides the user with the means to sequence information in ways that are most appropriate to a given task. It is found that hypermedia has now become the 'front end' for all Information Technology systems of all kinds – whether they be design of systems, cash machines at bank, control systems in a factory or database in an information system.

The first major tool to establish hypermedia as a practical environment for multimedia applications was *Apple's Hyper Card*. Today hypercard and its related product supercards are used by professionals to create very sophisticated hypermedia products. It is based on the process of linking together multimedia data elements, and allowing different options for getting from one to another. It is particularly a powerful approach in knowledge-based systems, where large information resource can be explored in a *fast* compelling fashion that suits the natural strategies; institutions and curiosities of the human mind.

Very often the two terms hypermedia and hypertext are used to mean the same thing. But it is necessary to distinguish them. Although hypertext strictly refers to textual information and is concerned with the presentation of information in a non-sequential fashion, it sometimes refers to bodies of information containing graphics and images as well. Later the description of historical perspective of Hypertext will help to make such distinction between them.

Interactivity is one of the key features of Multimedia. The interactivity in multimedia is facilitated by the hypermedia or hypertext, which is the need to link text with images and vice versa in a multimedia product. The extent of interactivity involved in multimedia is of careful consideration and evaluation of multimedia products. Though hypertext differs significantly from printed text in its structure, it shares many similarities for the reader, for example, the earlier programmed instruction texts. Despite their node and link structure, hypertexts are still composed of units of text at paragraph level and there is no reason to believe that they are read differently from units of conventional paper or electronic media.

8.8.2 Hypertext - Historic Perspective

The origins of hypertext can be traced back to some considerable length of time for example, in the works of Aristotle, that in the past there was an appreciation of the interconnectedness of information. But its overview in the technology era is only appropriate and its brief overview of the history is given here.

The following enumeration of historical events show the chronicle of development of hypertext and the individuals associated its various intricate concepts.

Table 8.5 : Hypertext Evolution

Date	Nature of Contribution
1945	Vannevar Bush proposes Memex.
1965	Ted Nelson coined the word Hypermedia and used the term Hypertext.
1967	Andy van Dam- the Hypertext editing system and FRESS Brown University.
1968	Dong Engelbart invented mouse and multiple window screens and many components of hypermedia. He produced the NLS (oN Line System) which embodied features that were to become prototypes for all hypermedia systems.
1968	Alan Kay built cardboard model of Hypermedia system called the 'Dynabook'.
1969	Charles F. Goldfarb of IBM introduces Generic Markup Language (GML).
1978	Aspen Movie-Map, first hypermedia videodisk Andy Lippman, MIT Architecture Machine Group.
1980	Charles F. Goldfarb introduces Standard Generalized Markup Language (SGML), sponsored by American Standards Institute (ANSI).
1984	William Gibson used the term 'cyberspace'.
1984	Filevision from Telos; limited hypermedia database widely available for Mac.

It was Vannevar Bush who enunciated the idea of hypertext as early as in 1945, the paper 'As we may think' by him was most often cited as the birth of hypertext. Bush was appointed as the first Director of America's Office of Scientific Research and Development by President Roosevelt in 1941. He saw the problems associated with ever increasing volumes of information. To cope with this plethora of information, Bush designed (conceptually, at least) the *memex* — "a device in which an individual stores his books, records, and communications and which is mechanized so that it may be consulted with exceeding speed and flexibility". More than simple repository, the 'memex' was based, on "associative indexing, the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another. This is the, essential feature of memex. In conception, memex was a remarkable scholar's Workstation and Bush anticipated that it would allow a new form of publishing with documents 'ready-made' with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified. Unfortunately, the technology of the day was not up to the task of instantiating the memex.

Bush assumed that microfilm would cope with the bulk of storage problem, which might have been true then. However, the level and complexity of indexing and retrieval required by memex was certainly beyond microfilm-based technology. The memex was a problem in search of a solution and the solution was the computer. Though Bush is often regarded as the founding father of hypertext or multimedia, he did not name this nascent field of endeavour.

The term *hypermedia* is attributed to Theodor Nelson. Nelson was by no means the only person working on the ideas of hypertext. Many others have contributed towards the development of the concept hypertext. For example the pioneering work of Dong Engelbart merits special mention. Bush, Nelson and Engelbart represent three different views of hypertext which continue to attract even today.

"The Bush view sees hypertext as somehow 'natural' reflecting, the mind or (in the strongest form of this position) modeling the mind; from this perspective, hypertext should feel easy-to use. The Engelbart view of hypertext is an augmentation environment, the

user of hypertext, should be able to achieve more than what would be possible without it. Although Nelson's vision is as a storage and access mechanism; the user of hypertext should be able to access any document, and such ease of access should work to break down subject boundaries". These views are not mutually exclusive. It is possible to advocate a hypertext system which provides ready access to all information and therefore allows user to perform new tasks. However, the fact that different views can proliferate illustrates the point that hypertext is not a unitary concept, not a single thing which can be defined precisely.

8.8.3 Hypermedia, Hypertext and Multimedia

One of the salient features of multimedia is use of hypertext linking to variety of media simultaneously. It provides for a non-sequential access to information unlike in the paper texts, where information is generally referred to page by page. Hypertext helps the user to navigate through their own sequence throughout the product. It is, in fact, known as interactive mode of use and it is the special feature of multimedia. The information in hypertext mode, which is normally a presentation followed in multimedia, is extensive and highly interlinked and can be regarded as a means of browsing through a database of information. The importance of hypertext lies in the fact that it may alter the way in which we read, write and organize information.

Hypermedia on the other hand is a hypertext in which contents of the nodes may include, text, graphics, digitized speech, audio, pictures and video clips and so on.

8.8.4 Application in Libraries and Education

Multimedia is widely acknowledged as an environment with great potential in education. It is able to assist both student and teacher in new ways of learning and teaching. In this age of information explosion, rapidly expanding volume of information presents problems of access, shifting and cost of acquisition to the ultimate user. In this context many of information sources are now being made available in multimedia mode. Reference books like, dictionaries, encyclopaedias are now available in this mode, hence multimedia is going to revolutionize the information access and use in the libraries.

Self Check Exercises

- 13) Give a descriptive account on the features of DVD.
- 14) Enumerate different categories of DVD.
- 15) What is multimedia ? Explain its characteristics.
- 16) Define Hypermedia and Hypertext and their role in information delivery.

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

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

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8.9 SUMMARY

For recording and storing knowledge, man has used different media- from stone to optical media. This has given rise to distinct categories of media – Print, Non-print and Electronic Media. This implies, there is a constant evolution of media for recording and transmission of knowledge conforming the contemporary and local technologies, in relation to time. Paper invented by Chinese, moved to different parts of the world, and the movable type printing invented in mid 15th Century provided the impetus. Print media growing in number and varieties came along different sizes and finishes of paper enabling quality printing coupled with progress in printing technology. The explosion of print media, the fear of paper shortage and technological innovation in the production methods are the main reasons of libraries embracing non-print media especially the microforms. The microforms in the 1970s and 1980s were adopted by libraries for archival storage, as space saving method and for the acquisition of specialised documents. The technology of production and use of microforms was also well developed during the decades. Various formats of microforms, like roll films, aperture cards, microfiche and COM were in use. Another category of non-print media included audio, visual and audio-visual materials which were already part and parcel of all types of libraries. That included mainly, visual aids like film strips, slide, audio recordings, the gramophone records, audio tapes, and finally the motion films, and video tapes. The reasons for the study of non-print media by libraries also included their specialised methods and sources of acquisition, storage, processing and the facilitating their use.

The electronic media is another form of non-print media, but distinct from microforms. The electronic media is the main contribution of IT to the information storage, dissemination and transmission. It has totally revolutionised publishing integrating with printing technology. The different kinds of electronic media considered here are the magnetic and optical media, in addition the emerging DVD. The magnetic media covered are Tape, drum and disc. varieties of compact discs and DVD and beyond is also described in this Unit. The fusion of all media - print, non-print, electronic and optical has an exciting evidence in Multimedia. It represents the convergence of Computers, Digital Video, Digital Audio and Sound synthesis. Multimedia is a generic term for 'multimedia computing' or 'interactive multimedia': the use of a wide variety of media within a computer interface or hypermedia. The technologies involved in the *delivery of multimedia information* is through the hypermedia and/or hypertext methods. Hypermedia may include text, graphics, digitized speech, audio, pictures and video clips and so on. Both hypermedia and hypertext are concurrently employed in the access, navigation and delivery of multimedia information.

8.10 ANSWERS TO SELF CHECK EXERCISES

- 1) Media is plural of medium. It is the chief conductor, channel for information transmission. Paper has been a medium for centuries has played a major role so far in information communication. The preservation for posterity was an older adage, but has been in the reckoning in recording and preserving scholarly knowledge for generations to come. The Non-print media that includes, Microforms, A-V Material were used in the mid-20th Century, as a complement to Print Media, and has been also responsible for archival storage and access. The predominant role of technology is now being made clear with the advent of magnetic and optical media. The use of different media contemporarily shows that all these have played important role in the process of information communication.
- 2) Paper gets its name from the term papyrus. It was invented in China in 105 A.D. by Ts'ai Lun. It first spread to Turkistan by Arabs. In Spain the first paper industry was started in 1150 A.D. and thus entered Europe. It moved to America in 1690. The paper making machine into rolls was invented in 1798 by Nicholas Louis Robert in France, improved by Fourdrinier brothers and installed in England and America.

- 3) The concept of Print Media chiefly evolved out of the combination of Paper and Printing by movable types. The latter was responsible for spreading and disseminating the printed documents world over and thus the name Print Media was evolved as distinct from written documents. Print media has several categories, and the core category of information communication being the Book. The other categories of print media are; Brief text media comprising folders, handouts periodicals, magazines, newspapers, etc., Visual print media includes charts, posters.
- 4) No definite claim of timeframe can be made on the future of print media, though it is predicted to disappear in due course of time. It was threatened to be replaced by non-print and electronic media. However, it could be difficult to make a total substitution to print media by non-print or electronic media. This also makes rather unrealistic to assume that technology will replace print as a major media for information communication, and converting everything into electronic and digital form. It cannot happen in a near foreseeable future. The arguments put forward in favour of electronic media would suggest there would be considerable need for and demand for those back-up and archival media in the printed form. There are databases – particularly of electronic journals which are now available both in full-text electronic as well as printed forms. The deliberation of the survival of Print media and its future is an ongoing debate and an affirmative decision on this or that is futile. The duality will coexist at least for some time to come.
- 5) The advent of non-print media is necessitated by the information explosion in print media. The growth of specialized documents is also one of the reasons for adopting the non-print media for them. The technological developments in the production of non-print media and the convergence of printing with computers eased the production and duplication is the other reasons. Need for the study of non-print media is for the study of their handling; acquisition, storage, processing and use.
- 6) The microforms came in a situation where they could provide some kind of solution to print explosion as far as physical storage space is concerned. Microform is a generic term identifying visual information originally in paper form, which has been photographically reduced. In other words it is a term for any medium, transparent or opaque, bearing the process of their reproduction is called Microphotography and has been one of the main divisions of Reprography. There are basically two categories of microforms: Micro-opaque and micro transparencies.

Their main advantages are: (i) economy (ii) saving in space (iii) speedy acquisition (iv) file integration (v) easy mechanization and automation (vi) low cost on-demand information dissemination and distribution (vii) easy to archive (viii) easy to store, handling and retrieve (ix) ecological value and control of paper, pollution and cost, (x) integrity and durability of collection (xi) easy reproduction and aesthetic quality.

- 7) One of the categories of non-print media are the Audio, Visual and Audio Visuals. They are once considered as multimedia possessions of most of the libraries. The Audio materials consist of Gramophone records, Audio tapes. The Visuals are in many numbers some of them are paper based, some are translucent like overhead transparencies, and some of them are models, realia and graphics. The two categories of the Audio-Visuals are Motion Films, and Video Tapes. micro-images. The process is a photographic process of making greatly reduced documents which can be read only by magnification.

The Audio-visual media have always complemented the print media. They are even today part and parcel of many libraries and have contributed to the development of modern multimedia products.

- 8) The electronic media is used for the storage, distribution, and transmission of information. It includes magnetic, optical, digital and magneto-optical media. These media have a very important role in electronic publishing, particularly the Optical Media.

The forms of Electronic media are Magnetic and Optical and within them, the Magnetic tape, Drum, and Discs, the latter covering hard disc and floppy disc. The Optical media, originating from laser vision disc, has now also different formats, such as CD-Audio, CD-R, CD-RW, CD-I and the most popular CD-ROM. The Optical media in addition to electronic publishing has evolved the new multimedia concept.

- 9) Magnetic media as a secondary storage device with Mainframe computer has continued to be used in the era of microcomputers. Most revealing developments have happened in Magnetic media by enhancing their storage density and capacity by nearly 200% since they were introduced. The magnetic media now forms an integral part of mass storage and has been a main source of information on the Internet. It covers, Magnetic Tape, Drum and Disc. The first two formats have gone out of use, whereas Disc is currently the main storage and distribution media for all electronic sources.
- 10) The optical media revolutionized the concept of information storage and distribution. The emergence of digital content delivery and the multimedia concepts are primarily due to the advent of compact disc. The storage of textual, audio, visual and animated information, pictures graphics all in one media is a new era of awakening. This is facilitated by different categories of Optical media. That includes: CD-Audio, CD-Interactive for Multimedia, CD-ROM and WORM for mass textual storage and databases, periodicals and reference books. In addition to these, CD-Recordable and CD-Re-Writable discs are also now available.
- 11) Compact Disc - Read Only Memory one of the most extensively used format is now a main compact storage device for Text and Non-textual Information. It can be used with virtually any size of computers - with stand alone and/or in Networked servers and juke boxes. The exciting features of CD-ROM are its ability to handle and play a wide variety of material viz. books, periodicals, directories, education materials, games, music, movies, communication mode data types include animation graphics, software, sound, text, video and capacity to hold up to 660+ MB of information, which is equivalent to 440 1.44 MB Floppy discs, 18 hrs of sound and up to 700 million characteristics of text and up to 74 minutes of movies or the video. In addition to the above features, the CD-ROM production has been simplified and it has been one of the most exciting features of the Compact disc.
- 12) In Library applications the CD-ROM has been playing greater role than other categories of compact discs CD-ROM represents an exciting breakthrough in information storage technology. It is a new publishing medium, the centre of a new genre computer applications, and an educational tool of unprecedented power. It is also used to store entire database and by using keywords or descriptors, data can be quickly searched located, thus saving many hours of tedious searching through indexes for any particular information in printed form. The benefits are; libraries can have economic access to information, a large quantity of information is stored on a small disc. CD-ROM database is found to be cost-effective than the Online Systems. Use of CD-ROM in libraries has come as a great solution for storage of Databases, Full Text Journals, Reference Books and as a Multimedia products.
- 13) The technology fusion has made marked progress in the fields of Laser Vision and Optical Media. This has resulted in the advent of the Digital Versatile Disc (DVD). The magnetic and optical media sectors of technology are converging on DVD - ROM and Video versions. Next the storage of non-textual form, audio and visual documents and also other non-linear access would demand a compatible media, hence the Digital Video Disc now known as Digital Versatile Disc and the other optical storage systems have now facilities for non-linear access too.

DVD, which was initially known as Digital Video Disc has been the Digital Versatile Disc, is a high capacity CD-size disc for video, multimedia, games and audio applications. It is a multi-application family of optical disc formats for read-only,

recordable and re-writable applications. Capacities for the read-only disc range from 4.7GB to 17.1GB on a 12cm disc with a throughput equivalent to 12-speed CD-ROM drive. DVD adopts a 'one-size fits all' types of a philosophy allowing storage of home entertainment, computer and business information with a single digital format. The high quality of video and audio has helped DVD-Video to replace VHS for pre-recorded titles and to increase the overall video market in most regions. The general term DVD actually subsumes two types : DVD Video and DVD-ROM. DVD started in 1994 as two competing formats, Super Disc (SD) and Multimedia CD (MMCD). DVD now is the result of an agreement by both camps on a single standard to meet the requirements of all the various industries involved.

- 14) DVD disc vary in capacity, application, and storage format. It is important to know the formats and media. There are : a) Physical Formats b) Formats for DVD Applications and c) Formats for Data storage.

Physical Formats : Physical formats are based on the physical characteristics of DVD discs. The following four types of physical DVD disc formats are available.

DVD-5 : Is a single sided, single-layered DVD with 4.7 GB storage capability.

DVD-9 : It is also single sided but dual-layered with 8.5GB storage capability.

DVD-10: Is double sided, single layered with 9.4 GB storage capability.

DVD-18: Is double sided, double layered with 17 GB storage capability.

Application Formats: The physical formats describe the media on which the data is stored, and application formats describe what kind of data- software, video or music, is stored and how. These include:

DVD-Audio: Provides higher quality audio storage than what is available for CDs.

DVD-Video: It has capability to produce near-studio-quality video using high-quality MPEG-2 Video compression.

Data DVDs: A DVD disc can also be used for storing ordinary data from a computer, such as printed documents.

Writable Formats or Formats for Data Storage: The physical application formats as listed above, tell the physical characteristics of a disc and the type of data stored on it. The writable formats define the different ways data is written to and read from the DVD disc, be it audio, video or computer data. There are several formats in this category.

All these categories and formats are represented by: **DVD-Video, DVD-ROM, DVD-Audio**, and the Recordable formats such as DVD-RAM, DVD-RW and DVD-R are now being extensively used in PCs.

- 15) Multimedia technology is the convergence of computer, digital video, digital audio and sound synthesis. A simple definition of multimedia is "It is a generic term for 'multimedia computing' or 'interactive multimedia': the use of a wide variety of media within a computer interface or hypermedia programme. The media on which multimedia is held are number of them – CD-ROM, CD-I, and CD-A and so on. The four important factors of all multimedia system are ; i) they need very large memory stores, ii) specialized and powerful processing technology to handle retrieval, processing and display of the large volumes of information. iii) deliver text and numeric, output and display architecture and capable of delivering both sound and images. iv) the rich and complex environment becomes useless unless users can easily find their way around it, locating and accessing the information that they require.
- 16) According to glossary of multimedia, Hypertext is "Text which allows user to 'hyper-jump'. Hypertext is basically same as regular text, with one exception: Hypertext contains connections within the text to other Web documents. Simply stated, hypertext consists of nodes(or chunks)of information and links between them.

The term *hypermedia* is attributed to Theodor Nelson. A technical definition of Hypermedia is "Interactive programmes in which information is stored in a number of different media and organised so that it can be retrieved and presented in a variety of ways that amplify meaning for the user. Hypermedia, on the other hand is 'hypertext' with links not only to text, but also to other forms of media – sounds, graphics, movies, video, animation and so on. Hypermedia consists of hypertext combined with still or moving images and sound. Unfortunately, 'hypermedia' and 'hypertext' are two terms that may be wrongly interchanged. same thing. But it is necessary to distinguish them. Although hypertext strictly refers to textual information and is concerned with the presentation of information in a non-sequential fashion, it sometimes refers to bodies of information containing graphics and images.

One of the salient features of multimedia is use of hypertext linking to Hypermedia provides for a non-sequential access to information unlike in the paper texts, where information is generally referred to page by page. Hypertext helps the user to navigate through their own sequence throughout the product. Interactivity is one of the key features of Multimedia. The interactivity in multimedia is facilitated by the hypermedia or hypertext, the need to link text and to images and vice versa in a multimedia.

8.11 KEYWORDS

Audio Tapes	: Audio Tapes or Cassettes are packed in cassettes with recording of sound and music and these require audio players. Recording can be monaural, stereophonic, or quadraphonic. The types of information found on recording are music, storytelling, readings, speeches, recitals, and sound effects.
Compact Disc(CD)	: Compact Disc, a digital medium formed of a 12cm polycarbonate substrate, a reflective metalized layer, and a protective lacquer coating. The physical format of CDs is described by the ISO9660 industry standard.
CD-A	: CD-Audio. The music CD's play music with Windows' Media Player, although typically you would use the software that comes with the CD-ROM Drive.
CD-I	: CD- Interactive, originally developed by Phillips and defined in the green book, is a special way of storing information on a CD, which provides much more efficient support for interactive multimedia applications.
CD-R	: Compact Disc-Recordable. This term is used to describe the technology of recordable CD as well as the equipment, software and media used to make recordable discs. <i>CD-Recordable</i> discs also have an organic dye data layer between the substrate and the metal reflective layer.
CD-ROM	: Optical storage media, as typified by the CD-ROM is a much-increased storage media required for multimedia applications. The CD-ROM is rather like a traditional long playing record, but different in tracks, which in CD are read at constant linear velocity. A typical CD-ROM can store up to 650MB data, which corresponds to 250,000 pages of A4 text, 7000 full screen images, 72 min of full bandwidth animation or full screen video, or 19 hours of audio.
CD-RW	: A CD - Rewritable (CD - RW) is computer data storage media that works just like a standard CD except that you can write to it over a thousand times. These CDs are made from new virgin material, all the packaging is recycled - the jewel cases are

made from recycled plastic and the info sheet is made from recycled paper. These CDs are environmentally more friendly because they hold a large amount of information and because they are reusable.

- COM (Computer Output Microfilm)** : A microfilm produced directly from computer data without the intervention of hard copy or photographic process.
- DVD** : Digital Video Disc has been the Digital Versatile Disc, is a high capacity CD-size disc for video, multimedia, games and audio applications.
- DVD-ROM** : Similar to CD-ROM discs, but with higher storage capacity. DVD-ROM can be read in DVD Video players and computer DVD drives. The read-only disc is 4.7GB to 17.1GB on a 12cm disc.
- DVD-RAM** : DVD-RAM discs are like virtual hard disc with random read-write access. The discs are re-writable discs for more than 100,000 times. Capacity ranges from 2.6 GB to 9.4 GB per side for data storage and archive applications.
- DVD-R** : Similar to DVD-ROM, Write-once discs with a capacity of 4.7GB per side and 9.4 GB both sides. Two versions: DVD-R for Authoring, DVD-R for General use.
- DVD+RW and DVD+R** : Not official part of DVD family, but similar to the corresponding DVD-RW and DVD-R for General formats. DVD+RW can be written up to 1000 times and suitable for both real time video recording and random data recording. Capacity 4.7GB per side for video recording. DVD+R can be written to only once.
- DVD-Video** : Launched in 1997. Has become the most successful of all the DVD formats, and proved to be an ideal vehicle for distributing video content, and movie.
- DVD-Audio** : Launched in 2000. Slowly gathering momentum to become the format for very high quality, sound, music, offering the music industry new revenue opportunities.
- Floppy Disc** : A thin circular polymer disc coated with magnetic material on both sides and enclosed in a plastic jacket. It is a portable device used to store information and used with the help of a floppy drive.
- Gramophone Records** : The term is used to describe any disc format where an audio signal is recorded as a series of grooves, which are read using a stylus and amplification system.
- Hard Disc** : A rigid circular medium called a platter on which it is coated with magnetic material on both sides. It is high speed, high-density storage device. Hard disc are of two types – Disc Pack and Winchester Disc.
- Magnetic Disc** : A Thin platter similar in appearance to phonographic records. Discs are coated on both sides with magnetic material and are available as hard disc and floppy disc. Read-Write heads for each disc read tracks and sectors.
- Magnetic Drum** : In concept similar to Disc, but it is in cylindrical form and rotates at a very high speed. Reading writing heads are mounted on the drum for Bands and groups.

Magnetic Tape

: A thin film of plastic base (Mylar) and coated with magnetic material on one side only. Divided into record blocks. Available in different widths and lengths. There are tape drives, cassettes and cartridges.

Magneto-Optical Disc

: They use polarized plastics and lasers rather than iron oxide and magnetic heads to store and read data. These are another type of discs in use today, and they are bit different in the sense that zero and one bits are recorded on an MO disc with bits of plastic that are aligned with either a left or right polarization.

Media

: Plural of medium. It is the conductor, channel and the means by and through which information is transmitted – Media change has been from Oral, written, printed, non-print and electronic media.

Microforms

: A generic term identifying visual information originally in paper form, which has been reproduced photographically in a highly reduced form. It consists of Roll Films, Aperture Cards, Filmstrips, Microfiche, Microcard and Microprint.

Movable Types

: A technique of printing invented by Johaan Gutenberg in mid-15th Century and which revolutionised printing and mass production of documents.

Paper Sizes

: There are two basic categories of sizes of paper. The British Standard and International Sizes. British sizes are Foolscap, Crown, Royal, etc. and the International sizes are A, B and C.

Papyrus

: An ancient paper like material made from the tall stem of a river plant. Found in Nile River and the material mainly used in Egypt.

UDF

: Unified Data Format

USB

: Universal Serial Bus

Video Tape

: It is used to record programmes in pictures and sound using Video Tape. Videotape store magnetic signals for simultaneous subsequent retrieval of the visual and the audio information components.

Winchester Disc

: It is a high capacity hard disc and used mainly on Microcomputers and packed in sealed enclosure. It is now an important hardware for all information storage and distribution requirements.

WORM

: Another storage niche technology – WORM – Write Once Read Many. These can write to a medium that is initially blank, but only one time write.

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UNIT 9 PRINTING AND PUBLISHING TECHNOLOGY

Structure

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- 9.2 Letter Press Printing or Relief Printing
 - 9.2.1 Printing Machines
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- 9.16 Keywords
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9.0 OBJECTIVES

The developments in printing and publishing technology have ushered in a new area of information dissemination. It is, thus, nessessery that you should be conversant with its basics. In this Unit we will be discussing the preliminaries of printing and publishing technology. After reading this Unit you will be able to:

- acquire broad line knowledge of various aspects of printing techniques in the production of printed material;
- appreciate the present trend in composition like DTP, Image setting, and colour scanning; and
- acquaint with the present method of Author Inputting the Data and further generation of primary; secondary source information through machine operation not only for print medium but also for the machine retrieval.

9.1 HISTORICAL BACKGROUND

The earliest form of communication other than oral was stone writing, parchment writing, and leaf writing. These means of communication were predominantly used for religious preaching. The earliest form of making multiple copies from engraved wood block was practiced by the Chinese. With the introduction of Papyrus (now popularly known as Paper) by Egyptians, made out of Hemp straw was used for making multiple copies from wooden engravings manually. This transfer technique was continuously used till John Gutenberg introduced the concept of single movable types meaning each character having a separate body; and with the assortment of types of various characters, one could assemble uniform types in the sequence to form words, sentences, etc.

This invention is considered even today as the beginning of the Graphic Art, literacy, civilization, and growth of knowledge. This invention also resulted in designing various typefaces and reshaping the characters for various language scripts. But then, with the each designer designing a typeface and type founding (with the alloy of Lead, Tin and antimony), also fabricated the machine for printing with his or her designed type. The standardisation of type height (.918), and type size measurement in terms of point (72 point in an inch) and print area (12 points) was effected by the French Didot. Consequently, all the printing machines were standardized to take type height of .918 inch. This system of printing is named as Letter Press Printing. The planographic printing, was invented by Alois Senefelder. The third process of printing Intaglio Printing or Gravure Printing was introduced at a much later date.

9.2 LETTER PRESS PRINTING OR RELIEF PRINTING

As the term implies any surface which has to be printed is kept in relief; and non-printing surface is engraved so that the ink applied by means of rollers on to the raised surface which could be transferred on to paper by means of pressure. A typical example of a type is shown in (Figure1). The assortment of types are kept in a specially designed furniture (Figure 2) consisting of two frames upper and lower. The upper frame consists of uniform size boxes where in capitals, small capitals, numerals and special characters are kept and the lower frame consisting of boxes of different sizes contains the types, commonly used as lower case so that the compositors (the individual would do the operation of picking up individual characters to form words and sentences) have innumerable number of types for his work. Such assembled lines set to pre-determined measurement are transferred on to a metallic tray called galley (Figure 3). With sufficient number of lines composed and locked up, a proof is taken through a proofing press which is the first proof and also called galley proof. Then such galley proofs are corrected using standardized

proof reading marks (BIS standard) (Figure 4) so that the compositor can rectify the mistakes and a revised galley proof is taken, and that corrected material later on is made up into page format incorporating page number headings, tables (separately composed) and last but not the least blocks for illustrations.

The illustrations are classified into three categories:

- 1) Line drawing with a clear demarcation of black & white without any intermediate gradation (example graphs).
- 2) Halftone illustration – Photographs which have between black & white intermediate tones.
- 3) Colour illustration is of anything within the prismatic colour range.

The process of block making is not discussed in detail since the entire process of block making and printing is becoming more expensive and laborious, thereby resulting in lesser use of this process of printing. However the description of various types of illustrations and their processing for printing will be discussed in detail later.

9.2.1 Printing Machines

Such made up pages are lock together, 2, 4, 8 and 16 as the case may be according to the size of the machine with which the printing is to be done. While doing so, it is important to put sufficient spacing material between the made up pages to ensure uniform margin in spine, head, forehead & tail (Figure 5). There are three types of letterpress printing machines. Platen (Figure 6), wherein a composed material and the impression imparting surface are flat and in the second version which is called a cylinder machine (Figure 7) wherein the composed material is flat and the impression imparting surface is cylindrical thereby resulting in better output. The third version is called rotary type (Figure 8) where the composed material is converted into cylindrical surface either by stereo type or electro type process and the impression imparting surface is cylindrical with paper fed in a continuous web rather than sheet resulting in much faster output. Normally this type of printing was used for Newspaper printing or other printing where large-scale production is required.

9.2.2 Mechanical Composition

The system of composition with single movable types done manually is not only very slot but also the compositor can make many inadvertent mistake like wrong font, broken characters, interposed characters, etc. The output of compositor could hardly cope with the demand for print in the context of the advancement of literacy, science and technology which was resulted in the innovation of mechanical means of composition, like Linotype and Monotype. As the term implies, Linotype; a line of type is cast on a single body by assembling the matrices mechanically through the key-board operation and casting a slug or a line of type by pumping molten metal through a mould to regulate the line length, the type height and the type size (Figure 9). The second system of Monotype consists of two units: key-board and casting; and the connecting medium is the punched paper spool created by the key-board actuating the casting unit matrix case (Figure 10) to bring the right type of character one by one as commanded in the paper spool and the individual type is cast by pumping molten metal through the mould. The Linotype, even though is a single machine operation has got disadvantages: that even for a single correction, the entire line has to be recomposed with the possibility of some fresh errors creeping in and the machine time has to be used for unproductive correction operation. While in Monotype where individual characters are cast on a single body, the correction can be carried out manually without going back to the machine. Even though it is a two-unit operation the output is more; further, one has in command many character positions. The tabular setting and complicated mathematical setting is done more with ease as compared to Linotype. That is the reason this system of composition was more popular for book work and much more in case of complicated text. In spite of the mechanical means of composition, the output of these units was not comparable to the quantum to be printed, and also it created

9.2.3 Demerits of Process

The Letter Press Printing Machines designed to carry the weight of types, were not only bigger in dimension but with much less output. In spite of the fact that the Letter Press Printing or the Relief Printing with fresh cast types is capable of producing top class quality printed material, both in sharpness and in ink density, it gradually paved the way for Lithographic Printing Process except of course in small scale stationery printing.

Self Check Exercise

- 1) Discuss the development of printing from the earliest time.

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

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

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9.3 PLANOGRAPHIC PRINTING OR LITHOGRAPHIC PRINTING

As the term planography implies both printing and the non-printing surfaces are in the same plane and work on the principle of antipathy of water to grease. The term lithography derives from the Latin word 'Lithos' meaning porous stone and 'Graphy', means writing, from the original invention of stone writing by its inventor Alois Senefelder. However, today the stone is completely replaced by metal. Any greasy image created either by hand or by photographic means can be printed by this process.

Since large volume of reading material cannot be written worthy of printing, initially, the proofs taken out of Lino and Mono composed material were used. With the introduction of Photocomposition, it has become the popular mode of composition for lithographic printing. Before discussing the various stages of printing of this process it would be appropriate to appreciate the present level of development in composition techniques.

9.3.1 State-of-Art in Composition

For the Letter Press Composition, manual or mechanical, the operator has to take a decision at the end of every line with regard to division of word or alignment of the line by spacing out or spacing less. It was estimated that this time of decision-making is almost 20% of his operation time. As a matter of fact when the first generation photocomposition was introduced matching the technology of hot metal the engraved matrices were replaced by Photo matrices and hot metal mechanism by photo technique, there was hardly anything done with regard to time lost on decision making with regard to word division. The problem

becomes more acute when the decision is taken by various people on different times for the same book. There would be hardly any standard practice.

9.3.2 Word Processor and Desk Top Publishing (DTP)

This is the time when Word Processing Hardware was introduced mainly for cutting down secretarial work but could also be used as a composing machine with an added advantage.

- a) Right Hand alignment could made automatic;
- b) Correction could be carried out on the memory;
- c) Page formatting could be done;
- d) Spell check could be effected;
- e) Cutting down the lethargy of proof reading operation and division of words by a certain logic which is constant throughout.

Taking advantage of Word Processor the second generation Photocomposition was introduced by making it to a Software solution, enhancing the output. With the wider use of laser technology third generation photocomposition units were developed. The unique feature of this generation is that it has completely done away with the technique of formation of characters using pre-determined Photo matrices. The character formation of different family style, through a light beam takes place at a very high speed. The sharpness of the characters could be varied in terms of DPI (Dots per Inch). For this system though initially Dot Matrix Printers and Letter Quality Printers were used; subsequently Laser machines which could give the exact replica of the way the final printed product would look, including capitals bigger size letters, italics and special characters were used. It is during this period the PCs were introduced with all software for word processing coupled with laser writers, as output device with wide range of software for type style, page formatting, composition of high mathematics and technical literature, graphic software, etc. This has resulted in composition becoming very clean and fast. This package of PC, Laser Writers and softwares is being marketed as a capsule product in the name of Desk Top Publishing (DTP). This enables the author to input directly on to the key-board his thought content into graphic format with such a variety of user friendly softwares available that the author himself cannot only format the pages but could also visualize exactly, how it is going to appear in the finished printed product. That is the reason-why though it is a composing system, it is called a publishing system.

Today one can have a Laser output unit anything from 300 DPI to 1200 DPI. The 300 DPI can be good enough for certain type of jobs. For finer quality job, one has to think in terms of higher DPI, but then since the image is heat-fused power image, it may not be acceptable for certain type of jobs, especially where superiors and inferiors and special characters are used, positively, not for the type of jobs where the graphics also is meshed with the text. Further for any paste-up to be done out of laser output one has to be careful with the type of adhesive will dissolve the powder image resulting in spreading of the image.

9.3.3 Image Setter

Taking advantage of the level of development in PC's, software, including high level graphic software capable of recording and processing black and white and colour illustrations the fifth generation photo-setting systems were designed and marketed as 'image setters' which are totally based on post-script language. This system is capable of giving single piece output on silver halide emulsion either in the form of negative or positive for book work which could include, apart from text, line, half-tone and colour illustrations. In science-publishing scenario, especially in journal production, with authors

submitted the paper in the floppy form the final version, using Tech software (universally adopted in the Western World) is formatted, articles are sequenced and paginated and the output is taken by the publisher. In this process, the entire textual information including graphics are available in the machine readable form. The machine-readable form opens new vistas of generation of secondary source information publication, Data Base creation, Access to main text information on networking, creation of CD-ROM, etc.

9.3.4 Paperless Society

These developments, it is professed, could lead to a paperless society. But it is not so. After all, the creator of any innovative idea would like to see his creation in print. Nothing gives more satisfaction than to find his thoughts in print. Further, in spite of many means of communication, only printed word carries authority. It is quite likely that what is printed could become less and less due to increased cost of production, but never a paperless society.

As regards the dailies the correspondent and the reporters could write the stories in different locations and transmit the stories through networking, e-mail, etc. to the main system in the newspaper office. The Editor can edit the story and call for each edited story at the time of page display and command the image-setters to get the single positive of the whole page including illustrations, also controlling both classified and display advertisements. From such full page positive, plates could be made and printed through Web Offset. With the launching of satellites newspapers can manage to bring out editions from different cities, by monitoring from one control office and the remaining stations will have facsimile receiving facilities, plate making and printing only. As a matter of fact some of the dailies in our country are doing simultaneous publishing of various city editions taking advantage of facsimile transmission through satellite. The fact that the entire newspaper page is available in the machine-readable form, it opens the scope for electronic news edition (the system in vogue in America) and also creation of CD-ROM not only from the point of archives but also for storage and retrieval (Figure 11).

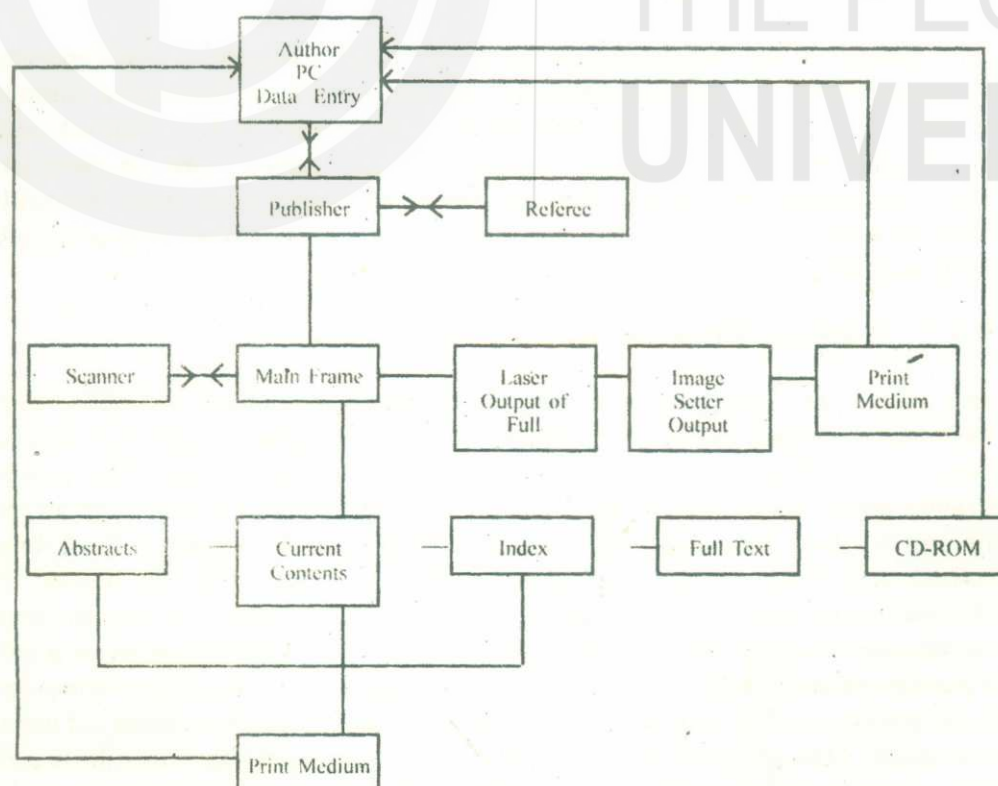


Figure 11 : Flow chart

Self Check Exercise

2) Describe various composition techniques of print matrices.

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

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

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9.4 ILLUSTRATIONS

The illustrations which are printed could be categorized into three types namely:

- a) Line.
- b) Half-tone.
- c) Colour.

9.4.1 Line Illustrations

Line illustrations are those which have only two tonal values that is black and white. Reproduction of such illustrations is simple. Normally the size of the original illustration drawn is 1.25 to 1.50 times more than ultimate size required, so that when the contact bromide is made from the reduced negative, one gets sharper image. In many cases reduction through Xerox process can also achieve the desired result. Such reduced line illustration can be positioned in the laid-out page of text matter, to make the page complete along with folio, run on heading, etc. for further processing.

9.4.2 Halftone Illustrations

Any original which has got intermediary tonal values between black and white, when it has to be reproduced, the area of printing is varied by producing a negative of varied dot size. It is done by using a screen which is nothing but two parallel-lined film cemented together perpendicular to each other. This screen is kept in contact with the light sensitive film, so that the reflected light from the original is split into dot formation. Such contact screens are available in various gradations like 65 lines, 85 lines, 100, 120, 200, etc. The choice of the screen is dependent on the type of paper to be used. The finer the screen the smoother should be the finished of the paper (Figure 12). Even though we are printing a photograph in terms of dots of various sizes with same black ink, we get various tonal value gradations of the original, by mere optical illusion. It has been found out that the best optical illusion is obtained at 45 angle for mono colour printing. Since the line area and in between transparent area are identical, 50% of the area of the photograph is printed and it is called Half-tone. Necessary space is left for the photographs, and the half-tone negatives processed separately are sandwiched in position in the main line negative, ready for further processing.

Colour illustrations are those covering the entire spectrum of colours. Three pigmentary primary colours namely yellow, cyan and magenta are to be used to reproduce any colour original through any one of the printing processes. However, black is added to get more depth to the printed product. Having said that one has to print the pigmentary primary colours upon each other to get necessary colour mixture to obtain both secondary and tertiary colours, one has to pre-determine the quantum of each colour in different areas required to be printed. In earlier days this colour separation was done by process camera operation using different colour filters or combination of various colour filters to get the desired colour separated negative for each primary colour printing. But today the entire colour separation work is done by colour scanning. All one has to do is to feed the colour original (colour photograph, paintings, transparency) and command the machine for the required size; the scanner comes out with colour separated positives. It is needless to say that such illustration does have intermediary tones requiring the use of screen. However in case of colour printing different screen angles are used for different colours, so that juxtapositioning of dots is achieved to get the desired colour mixture. Like single colour half-tone photograph, the space is left blank in the laid out text matter page for colour illustrations.

Self Check Exercise

3) Discuss the various types of illustrations.

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

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

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9.5 PRESENT TREND IN COLOUR PRINTING

While describing the processing of various types of illustrations the conventional technique of operation is taken into account. However, with PC-based data entry coupled with high language appropriate software supplemented with scanners, post-script image-setter output device, the entire concept of working changes.

With the corrected floppy the entire page could be made up and the printout can be taken on Laser Writer incorporating both line and halftone illustrations by scanning the illustrations making necessary corrections and reduction or enlargement for the desired size. This laser writer output acts as a final page proof; once approved, the output can be taken through the image-setters in the form of negative or positive as desired. In case of merging a four-colour job along with the text matter the same principle is followed as that of half-tone illustration. However by using a colour scanner and commanding the image-

setter to give the output of film positives, four colour separated positives for yellow, cyan, magenta and black in single piece for each colour can be obtained. In spite of the fact that the system can give single piece positives both for colour and black & white, to process the graphics is time consuming, since the resolution required in terms of DPII of a high order, say minimum of 1500 DPI as compared to a textual matter of 900 DPI. It is up to one's choice to get a single piece including graphics or text and graphics separately to be pasted in registration as described in the conventional method earlier.

9.6 PROCESS WORK

In spite of the fact that there are image setters capable of giving direct negative/positives for plate making, still many jobs will continue to be processed by negative making from physically laid-out pages and laser output on paper. The process camera which is used for making negative is nothing but the normal camera all of us know, except that it is different in design and construction, considering the fact that it has to handle always a flat copy original, the negatives to be prepared are of a bigger size conforming to the size of the publication. To achieve the best results, slow high contrast Lith film is used, thereby maintaining uniform density range between the opaque and transparent areas of the negatives.

9.7 IMPOSITION/PASTE-UP OF NEGATIVES OR POSITIVES

The negatives generated through process or through image setters have to be imposed in appropriate position according to the size of the machine through which it has to be printed and the type of the folding. The necessity for this operation is to achieve the sequence of pages from both sides of the printed sheets after folding. While positioning of the pages, care is also taken to provide necessary margins in the pages, which have to be uniform throughout (Figure 13). Such paste up negatives require to be touched up by blocking the transparent pinholes, etc. keeping only of the print areas in transparency.

9.8 PLATE MAKING

This operation is basically printing on metal surface with pasted negatives. There are many methods of plate making:

- a) Wipe on process.
- b) Deep etch process.
- c) Pre-sensitized plate.
- d) Tri-metallic plate.

Basically aluminum or zinc plates are used except in case of tri-metallic plates where the base metal is aluminum with electrolytic deposition of copper and chromium on top.

9.8.1 Wipe on Process

Both aluminum and zinc plates are used with one side grained (Micro-grained, sand blast grained or marble ball grained). The necessity to use a grained surface is to enable the plate surface to retain the image and also to retain the moisture on the non-image areas. The grained side is coated with a colloid and dried to make it light sensitive. The pasted and touched negatives are held in absolute contact by creating vacuum in a special type

of exposure unit and exposed for a certain period of time with high intensive ultra-violet rays. While doing so, the light which has passed through the transparent areas of the negatives which correspond to the image areas, causes certain amount of chemical reaction by means of which not only the coating in the exposed areas gets hardened but also gets absorbed in to the metal. This hardening of the image is required since the image is constantly in touch with the damping rollers and inking rollers and the blanket cylinder. To strengthen the hardened imaged, further coating with solvent consisting of bitumen, tallow, soap, etc. is applied (developer) and washed with normal running water. In the process the original coating and the developer in the unwanted areas gets washed away leaving plain metallic surface in the non-image areas. A thin coating of the greasy ink from the developer in the hardened image areas remains. To protect the surface from getting oxidized, a thin coating of gum Arabic is applied

9.8.2 Deep Etch Process

Normally the plate making process of wipe on is cheap and quick to process, but the number of impression, the image can stand is limited to anything between 10,000 to 15,000. Further, the quality is tolerably good for many jobs but may not be good for some. In such cases the better plate making process, like, deep etch is adapted. The plate used is the same like wipe on process. However, the light sensitive colloid is different and instead of negatives, film positives are used and exposed, both positive and plate held in contact. While developing, the reversal process is followed to obtain greasy print areas and plain metallic surface in the non-image areas. In the process of developing, certain amount of metal is etched in the image areas so that the image areas are not directly in contact with damping rollers, inking rollers and blanket, with the result not only the image can stand up to lakhs of copies but also results in high quality image reproduction. Since the positives are to be used it makes it double the cost of film and the cost of chemicals used are expensive and the time taken to prepare the plate is also much more.

9.8.3 Pre-Sensitized Plate

This quality of plates has the same advantage as that of deep etch plate except that pre-coated plates are used. The quality is ensured throughout due to coating done through machine. As a matter of fact, for the entire colour work of high quality, such plates are being used. As compared to deep etch, the time taken to prepare a plate is much less. Further, this system has the advantage of getting the plates processed through machine.

9.8.4 Tri-Metallic Plates

As mentioned earlier it has aluminum as the base metal with electrolytic coating of copper and chromium. It is a known factor that copper has more affinity towards grease. Similarly, chromium has got more affinity towards moisture. The process of plate making is exactly the same as that of deep etch but while developing, the chromium coating is removed from the image areas. Plates so prepared can produce high quality work on account of the fact that proper water - grease proportion can be maintained. Further one can take as much as millions of copies from this plate.

9.9 LITHOGRAPHIC/OFFSET PRINTING MACHINES

Impression from the plate is taken indirectly through blanket. That is the reason why it is called offset process. Irrespective of size and make, basically an offset printing machine will have the following :

- i) Provision for stacking paper so that it can be fed one by one, either by hand or by machine.
- ii) Proper sheet control so that each and every sheet of paper is kept at the same point before it has taken control by next stage.
- iii) Set of water rollers with storage of water.
- iv) Set of inking rollers with the provision of storing ink and distribution through out uniformly.
- v) Plate cylinder with the provision for fixing the plate to be printed with appropriate mechanism.
- vi) A cylinder on which a rubber blanket is fixed.
- vii) Impression cylinder with a set of fingers to take charge of paper from the feeding end and to hold it in the same position while the printing is on.
- viii) Delivery system with the set of fingers.
- ix) Provision for piling the printed sheets to fall one upon the other properly jogged, with or without spray unit for drying the ink on the sheet of paper.

Fortunately, today, one has a wide range of machinery to meet almost every specialized requirement, such as high quality four colour printing, numbering, and slitting. There is also provision for drying, the printed sheet with special type of ink through ultra-violet rays. The working principle of the offset machine is as follows:

The paper from the stacked pile is separated and fed, one-by-one, through vacuum and the paper is taken control by the set of grippers of the impression cylinder. In the mean time the plate surface is moistened by the damping rollers and it comes in contact with the set of inking rollers. The greasy image area of the plate is ink-receptive and water-repellent whereas in non-image area it is water-receptive and ink-repellent. The thick film of ink on the plate is transferred on to the rubber blanket which in turn is transferred on to paper held by the impression cylinder through a set of grippers. All these three cylinders are inter-connected through a gear system and rotate at perfect timing. One rotation of these cylinders produces one printed sheet as shown in (Figure 14). The printed sheets are taken charge by another set of fingers and travel for a certain distance before being released on the delivery board. To cover up the distance more than one set of grippers are provided so that the ink on paper could dry before the next sheet falls. To further enhance the drying, liquid spray or powder is applied on the printed and delivered sheet.

Normally one side of the paper is printed and for printing the reverse side the same sequence is followed by fixing the corresponding plate on the plate cylinder, there are machines which can be operative to print both sides of the paper simultaneously which are called perfecting machines.

When it comes to four colour printing, it could be accomplished by using a single colour machine by printing four colours separately: yellow, cyan, magenta, and black in registration by feeding the sheet of paper four times and also changing the ink in the duct for each colour and by using the corresponding plate. But then to get a speedy output and better quality printing, use of two colour or four colour machines are advisable. Relative to a two-colour printing machine, the paper passes twice and in case of a four-colour machine the passage of paper is only one – what a control on the elongation/shrinkage of the paper fibers.

3) Describe the process of plate making.

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

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

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9.10 OTHER PRINTING PROCESSES

Apart from relief and planography printing, intaglio printing, dry offset printing and silkscreen printing are also in vogue for various types of work.

9.10.1 Intaglio Printing

This is also known popularly as Gravure printing. The principle is opposite to that of relief printing. The printing surface is engraved and non-printing surface is in relief. However, the depth difference is microscopic. The operation of composition, page make-up, the combination of text and graphics are exactly the same as that of planography printing. The page positives are exposed on to a copper cylinder and processed to get the microscopic depth in the image to highlight dots. The depth of the dots also varies from solid to highlights. Such prepared cylinders are mounted on to the roto gravure printing machine. The cylinder dips through a semi-liquid ink tank and by means of a doctor blade the ink is removed from the raised surface and gets the ink transferred on to a sheet paper by contact (Figure 15). Normally, an absorbent paper which has the property to absorb, the ink is used. By that process more depth of ink is obtained as compared to relief and planography printing. This ink layer has the tendency to spread. This property of spreading is taken advantage of in the reproduction of half tones both black & white and colour, to have the result of near continuous tone. Normally this process is used for any such publications where sharpness of printed matter is not that important, the reproduction of photographs in near continuous form is more important. The examples are any illustrated journal of popular nature and also posters, etc. One could apprehend the enormous cost of the copper cylinder and other operations which result in heavier cost. With the result this system is used only in case of long run jobs.

9.10.2 Dry Offset

While describing the relief, printing, it was said almost goodbye to the process on account of the cost of the alloy involved, proportionate output, intensive labour, more floor space occupation, etc. Whereas in case of planography printing, the problem of moisture creating elongation and shrinkage of paper and also graying of ink due to non-maintenance of water and ink proportion, etc., do exist. The resultant was the introduction of a new technique of printing called Dry offset, wherein the advantages of both the processes are synthetically inherited dispensing with the problems of both. Up to the negative/positive paste-up stage is the same as that of planography printing and instead of aluminum or

zinc, photopolymer plates are used resulting in microscopic relief image in the print areas. The machines used are such that the thin film of coating of ink on the plate is transferred on to the blanket without the dampening rollers. The cost of photopolymer plates and its further processing are very expensive, resulting in very high cost of production, uneconomical for short run jobs.

9.10.3 Silk Screen Printing

The process is commonly used for low-run stationery, menu-cards, window displays, stickers and sometimes posters where special type of ink is to be used.

A fine silk mounted tight on a frame is coated and exposed through positive and developed, leaving image areas porous, the non-image areas non-porous. Placing a sheet of paper at the bottom of such processed screen ink is squeezed from the top of the screen so that through the porous areas the ink passes and deposits a thin film of ink on the sheet of paper.

Here one can use any type of ink which normally cannot be used in any one of the above-mentioned processes due to its reaction on to inking rollers, blanket and the plates. This process can produce excellent results with good depth of ink almost giving a result in die-stamp version. As a matter of fact apart from paper, any other medium can be used with proper method of drying ink.

9.10.4 Flexographic Printing

This system of printing is more popular with package industries especially in foil printing. Instead of metal plates, rubber plates with image areas in relief are used. The machines are designed for continuous, web feeding. The drying of ink, cutting and shaping of different packages are done automatically.

9.11 BINDING

The printed sheets by any one of the processes described earlier need to be folded, collated, bound and trimmed to the size. The first binding operation is folding the printed sheets. This operation could be managed either manually or through machines. Such a folded unit is called a section, wherein the pagination would be in sequential order. To bring it to the shape of a book, the individually folded sections have to be gathered or collated. This collation could also be accomplished by rotary type of machines. There are a number of binding methods:

- 1) Centre Stapling/Stitching;
- 2) Side stitched and cover pasted upon;
- 3) Side stapling and cover pasted;
- 4) Perfect Binding;
- 5) Sections Sewn and paper cover pasted;
- 6) Hard Bound binding with full cloth;
- 7) Case in Binding.

9.11.1 Centre Stapling/Stitching

Normally in this type of binding the sections are inserted with cover on top make it into one unit and wire stapled or stitched the spine before it is trimmed to the size. This type of binding is used for the production of journals and books where the number of pages is not above 40 to 64 pages.

9.11.2 Side Stitching

In this type of binding the wire stapling is done at the extreme edge (say about 1/8") of the spine and the cover is creased and pasted before it is cut to the desired size. The entire operation of collating the sections and wire stapling could also be managed by a station-gathering machine with speedier output. Universally this system of binding is used for periodicals so that the spine of the periodicals bound together identifies the volume number, year, etc.

9.11.3 Perfect Binding

It is a fast and low cost method of binding involving more machine handling than manual effort. The folded and collated sections are fed to the machine which first trims, and roughens the spine making each sheet a separate entity, applies a special type of glue and the cover is wrapped on, dried, trimmed and outcome the finished product. All paperback publications are bound in this manner. Since this process of binding is less labour intensive many periodicals are also bound in this fashion in developed countries. The greatest drawback in this type of binding is that on constant use the individual sheets get separated, more so, in the tropical climate of our country. Further, in case such bound individual journal copies are to be bound together into complete volume, one has to pierce holes in the spine margin and through cord it is bound. This method of binding though is solid, yet one faces the problem of photocopying for the inner margin. In spite of various standards and conventions with regard to production of periodicals including the quantum of margin and the type of binding, cutting down the cost plays a major role in decision-making.

9.11.4 Sections Sewn and Paper Cover Pasted

This system of binding is used for the production of books or monographs which is more durable as compared to the system of binding explained above. Here a continuous thread is passed through various sections of the book in addition to a cord or tape giving additional strength. The period laminated cover is wrapped and pasted on the book and the end paper providing additional link between the book and the cover. Such bound books open completely flat while reading.

9.11.5 Hard Board Binding

Up to the stage of sewing, the book is the same as in the case of paper back binding and instead of printed cover, hard board is used and is wrapped round with printed embossed cloth, calico, leather, parchment. To further enhance the look, better-designed and printed dust jacket is wrapped around.

9.11.6 Case in Binding

This method of binding is normally in vogue for publications having a thick spine and of significance for literature search. The initial steps of folding, gathering, etc. remain the same as in other methods of binding. But, a case has to be wrapped around with the title embossed (using a male and a female die) or printed and linked with the spine with the head and tail bands, and the end leaves. A jacket can be wrapped on.

9.12 PAPER

Paper which is the finished product of the paper mill, is the basic raw material for the print shop. Paper is manufactured from a limited range of materials comprising fibres of vegetables origin. These fibers are of wood, hemp, esparto grass, linen and cotton. The fibers are of different characteristics thereby resulting in different qualities of paper.

All raw materials used for paper are crushed initially to make into a cellulose form and chemically treated and certain resinous agents are added and pumped into the main container of a papermaking machine. At that stage, the water content is maximum with

minimum of fiber content. Such liquid is allowed to flow over a wire mesh to travel a long distance so that water falls down by the centrifugal system. The continuous wet sheet passes through various set of polished, heated rollers not only to reduce the moisture content, but also to give a fine finish on both sides of the paper, and gets rolled into a web form (Figure 16). At the finished stage, the moisture content is to the order of 4 to 6%. In case of art paper the base paper manufactured is dipped through a china clay liquid and then polished through rollers to get the finest surface finish.

There are various varieties of printing paper namely, white printing, newsprint, map litho, offset, cartridges, calendared, imitation art & art paper. Various shades of cover paper are also manufactured with a slightly inferior substance and boards are manufactured with still inferior substance. Normally any paper is defined not only by size and quality but also by weight. The conventional system of identifying the weight in terms of kilograms per ream has been completely done away with, and it is identified in terms of GSM (grams per square metre). Paper is cut and supplied in a package of reams, 500 sheets in case of printing paper, 480 sheets in case of writing paper. Different sizes are mentioned below:

- 1) Fullscap 13 ½" x 17"
- 2) Crown 15" x 20"
- 3) Demy 17 ½" x 22 ½"
- 4) Medium 18" x 23"
- 5) Royal 20" x 25"
- 6) Imperial 22" x 28"

Normally in our country the paper is not manufactured in 'A' series and 'B' series, since most of the manufacturers still manage with the old machinery. The large size paper is cut according to the size of the machine available which may contain 4, 8, 16 pages or 32 pages in a sheet. When the above-mentioned sheet of paper of various sizes is folded along the long side, it is called folio. Different jargons which are used in identifying different formats, are illustrated in figure 17. However, with the use of standardized 'A' series and 'B' series of paper, connotation changes when the paper is folded along with the long side it is called A1, further on it is 'A2', 'A3', A4 and A5 and so in the case of 'B' series.

9.13 PRINTING INKS

Apart from paper, ink is another raw material for printing. Many materials come into the production of printing inks. The basic three groups are:

- 1) Pigments, which give the colour and stiffness to an ink.
- 2) Varnishes or 'vehicles', constituting the fluid portion, which carry the pigment and are responsible for the drying of the ink.
- 3) Driers and other materials which are added to improve drying, to reduce stickiness, etc.

Out of these basic groups various qualities of ink are manufactured. The right choice of ink plays a major role in the quality of printed product.

9.14 SUMMARY

In this Unit you have studied the historical and technical background of printing and publishing. Earlier process of printing describing letter press printing, the printing machines and composition used there in have been described. The concept of lithographic printing and the trend in the printing process have been explained. The technological development

in printing incorporated the use of computer and software starting from word processing software to desktop publishing software. The desktop publishing helps to get the output page ready in page format along with the necessary illustrations almost ready for negative preparation. The recent development 'image setter' has gone one step further. The system helps to take print on silver halides means getting negative or positive for printing.

Various types of illustrations – like illustrations, halftone illustrations and colour illustrations have been described in the Unit.

The process of plate making and different printing processes have been elaborated to get in-depth of printing and publishing. The Unit also discussed the other printing peripherals like process of binding, types and size of papers and printing inks.

9.15 ANSWERS TO SELF CHECK EXERCISES

- 1) Printing process started with the advent of single movable types of John Gutenberg, where character is to be fixed to form word, sentences, etc. this invention resulted in designing of various typefaces and size of characters for various languages. This system of printing is known as Press Printing. Next was lithographic printing where both printing and the non-printing surfaces are in the same plane and work on the principle of water grease. The third process of printing intaglio printing was introduced at a much later date.
- 2) Initially composition of print matrices was single movable type and it was very slow process. Then innovation of mechanical means of composition like linotype and it was very slow process. Then innovation of mechanical means of composition like linotype and monotype came into existence, implying assembling matrices mechanically through keyboard operation. The advancement in computer and software technology resulted into word processing and desktop publishing environment. In this the whole page is formatted having graphics and illustrations and the output is directly used for preparing negative. The recent composition technique 'image setter' gives output on silver halides in the form of negative or positive for printing.
- 3) Illustrations are graphics and images in the print matrices. The process of illustration requires the various lines and tones in print. These can be categorized into three types a) Line illustration; b) Half-tone illustration and c) Colour illustration. Line illustrations have two tonal values that is black and white. Normally the output of the illustration should be drawn 1.25 to 1.50 times more in size so that at the time of bromide the actual size gets clear and shaper image.

Half-tone illustration has intermediary tonal effects between black and white. These effects can be produced by using a varied dot size screen. Colour illustration covers the entire spectrum of colours. The basic three pigmentary colours namely yellow, cyan and magenta are to be used to reproduce any colour.

- 4) Plate making operation is basically printing on metal surface with pasted negative. There are different methods of plate making a) wipe on process; b) deep etch process; c) pre-sensitized plate and d) tri-metallic plate. Basically aluminum or zinc plates are used except in case of tri-metallic plates where base metal is aluminum with electrolytic deposition of copper and chromium on top.

9.16 KEYWORDS

- | | |
|-----------------------|--|
| Binding | : Process involving printed sheets to be folded, collated, bound and trimmed to the required size. |
| Character Font | : Type style of the character. Further, each type style can be in normal bold and italics mode. |

Character Size	: Height of the character.
Desk Top Publishing	: Technique used for word processing coupled with laser printers as output device with wide range of software for type style, page formatting, composition of high mathematics, technical literature, and graphic software, etc.
Galley Proof	: It is the first print of the composed matter for checking and proof reading.
Illustration	: Graphics and images in the text.
Image Setter	: Computer aided software capable of recording and processing black and white, colour illustrations and text. The systems gives single piece output on silver halide emulsion either in the form of negative or positive for plate making.
Imposition of Negative/Positive	: Operation involving positioning of pages from both sides to take care of necessary margins in the pages, blocking other areas keeping only print areas in transparency.
Offset Printing	: Processing where impression from the plate is taken indirectly through rubber blanket.
Page Format	: Putting the matter into page size incorporating page number, headings, tables, and illustrations.
Plate Making	: Printing on metal surface with pasted negatives.
Screen Printing	: Process involving fine silk mounted tight on a frame is coated and exposed through positive and developed, leaving image area porous and non-image area non-porous. Ink flow on the paper through image area causing print.
Text Composition	: A process of assembling the print matrices through movable types or keyboard operation.
Word Processing	: A technique used for composing text through computer software package.

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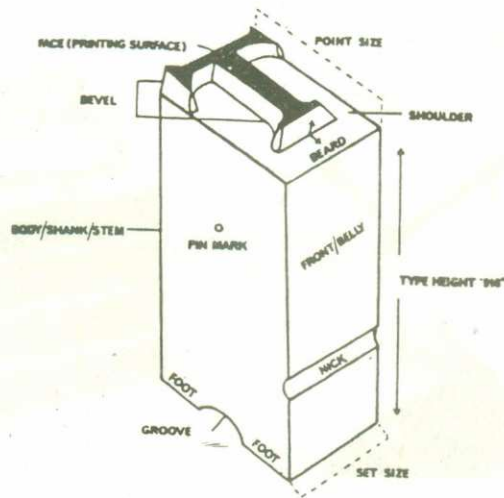


Figure 1 : Parts of a type



Figure 2: Type Case

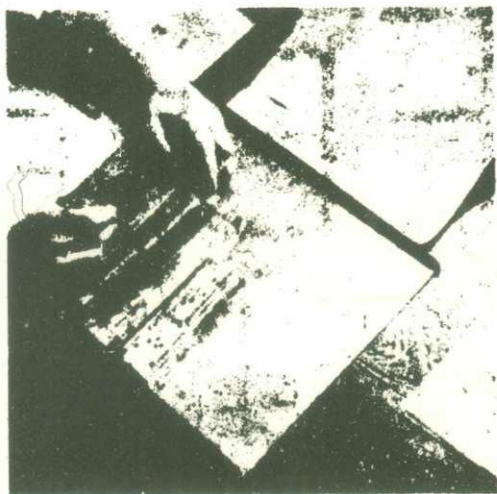


Figure 3(a) : Galley

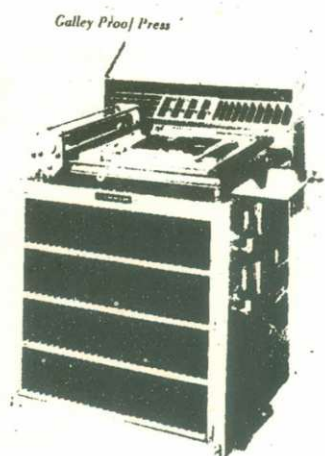


Figure 3(b) : Galley proof press

Proofreaders' Marks			Proofreaders' Marks		
Symbols	Explanations	Examples	Symbols	Explanations	Examples
GENERAL			PUNCTUATION		
Δ	Delete, take out	Δ The word	$\sim$	Insert hyphen	$\sim$ So-called
Δ	Delete and close up	Δ Proofreader	$ \text{---} $	Insert 1-em dash	$ \text{---} $ The proof
Δ	Out, see copy	Δ Jack and hill	$ \text{---} $	Insert 1-em dash	$ \text{---} $ The proof
Δ	See, let it stand	Δ The proof	$ \text{---} $	Insert 2-em dash	$ \text{---} $ The proof
Δ	Left out, insert	Δ Queen (Lis)	$\sim$	Advertising dash	$\sim$ The proof
Δ	Spill out	Δ A proof good	$\sim$	Insert comma	$\sim$ The proof
Δ	Transpose	Δ The proof	$\sim$	Insert semicolon	$\sim$ He said so
Δ	Straighten line	Δ The proof	$\sim$	Insert colon	$\sim$ These are
Δ	Insert lead between lines	Δ They will read letter	$\sim$	Insert period	$\sim$ The proof
Δ	Raise	Δ The proof	$\sim$	Insert exclamation mark	$\sim$ Look out
Δ	Lower	Δ The boom	$\sim$	Insert question mark	$\sim$ What proof
Δ	Turn inverted letter	Δ The proof	(* Also see Query Mark under Punctuation.)		
Δ	Push down space	Δ The proof	TYPE		
Δ	Query*	Δ The proof read by	$\times$	Broken or bad letter	$\times$ The proof
(* Also see Question Mark under Punctuation.)			Δ	Wrong font	Δ The proof
			Δ	Bold face	Δ The proof
			Δ	Italic	Δ The proof
			Δ	Roman	Δ The proof
			Δ	Lower case	Δ The proof
			Δ	Capitals & small capitals	Δ The proof
			Δ	Small capitals	Δ The proof
			Δ	Capitalise	Δ The proof
SPACING			Δ	Insert 2 ems	Δ The proof
Δ	Start paragraph	Δ done, Now	Δ	Insert 3 ems	Δ The proof
Δ	No paragraph	Δ done, However, it will	Δ	Close up, no space	Δ The proof
Δ	Align type	Δ Item (3)	Δ	Less space	Δ The proof
Δ	Move to left	Δ The proof	Δ	Insert hair space	Δ Jim told the proof
Δ	Move to right	Δ The proof	Δ	Insert space	Δ The proof
Δ	Indent 1 em	Δ The proof	Δ	Equalize spacing	Δ Joe read the proof

Figure 4 : Proof Readers Marks

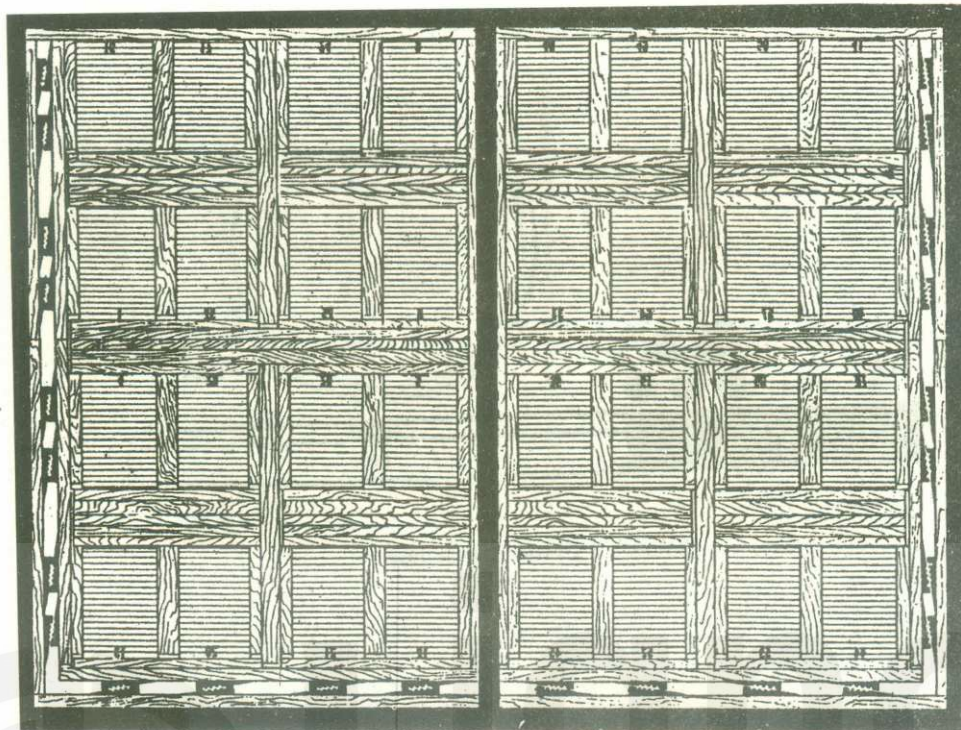


Figure 5 : Imposition of pages

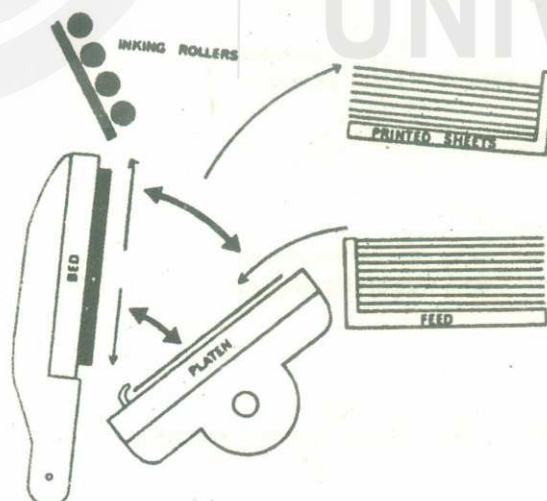


Figure 6 : Platen Machine

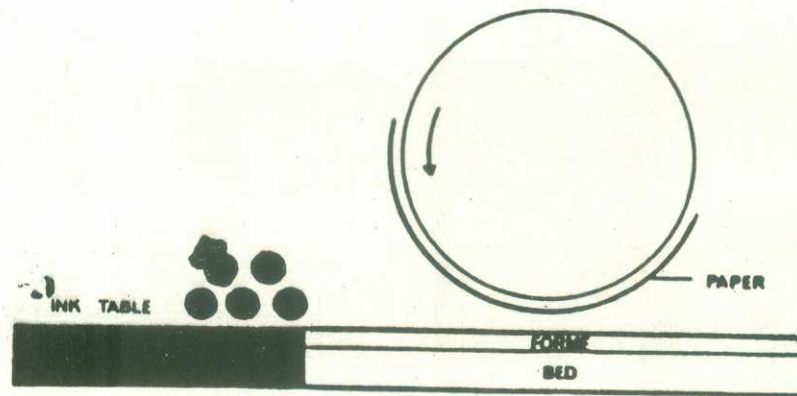


Figure 7 : Cylinder Machine

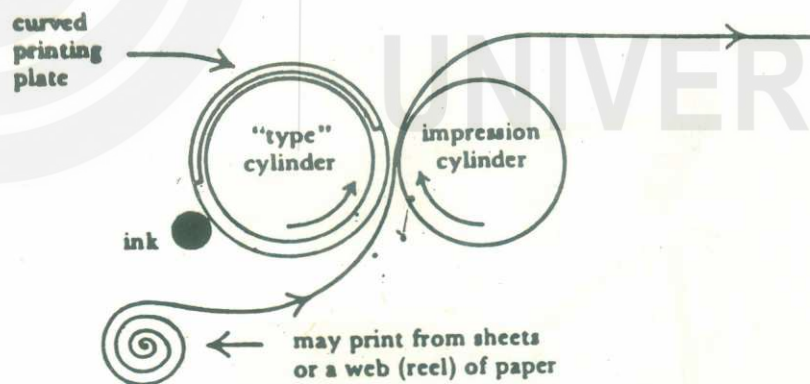


Figure 8 : Rotary type printing machines

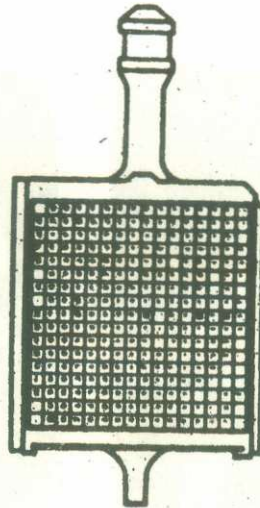


Figure 10 : Mono matrix Case

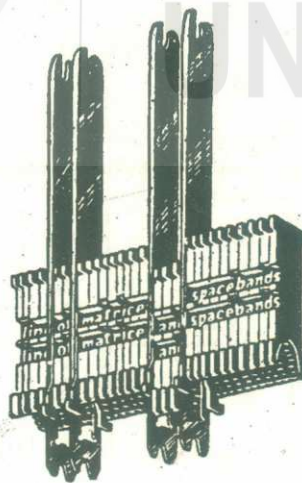


Figure 9 : Lineo-matrix and slug

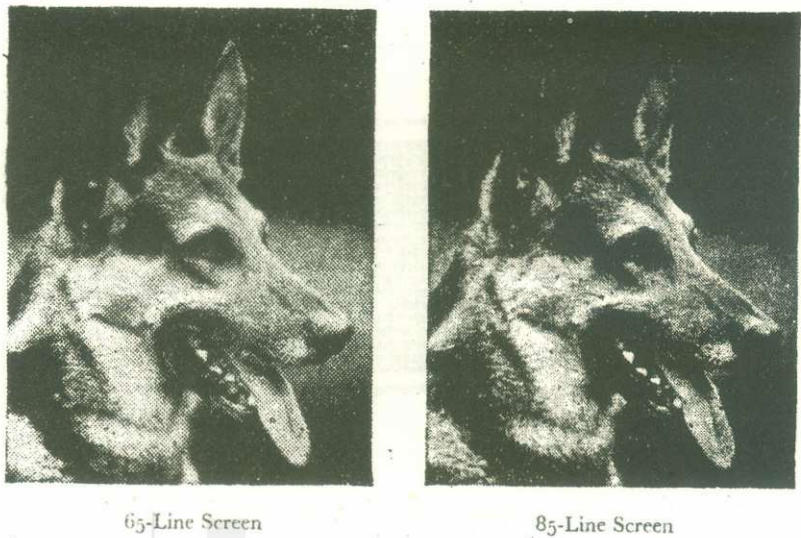


Figure 12 : Indicating half-tone screen

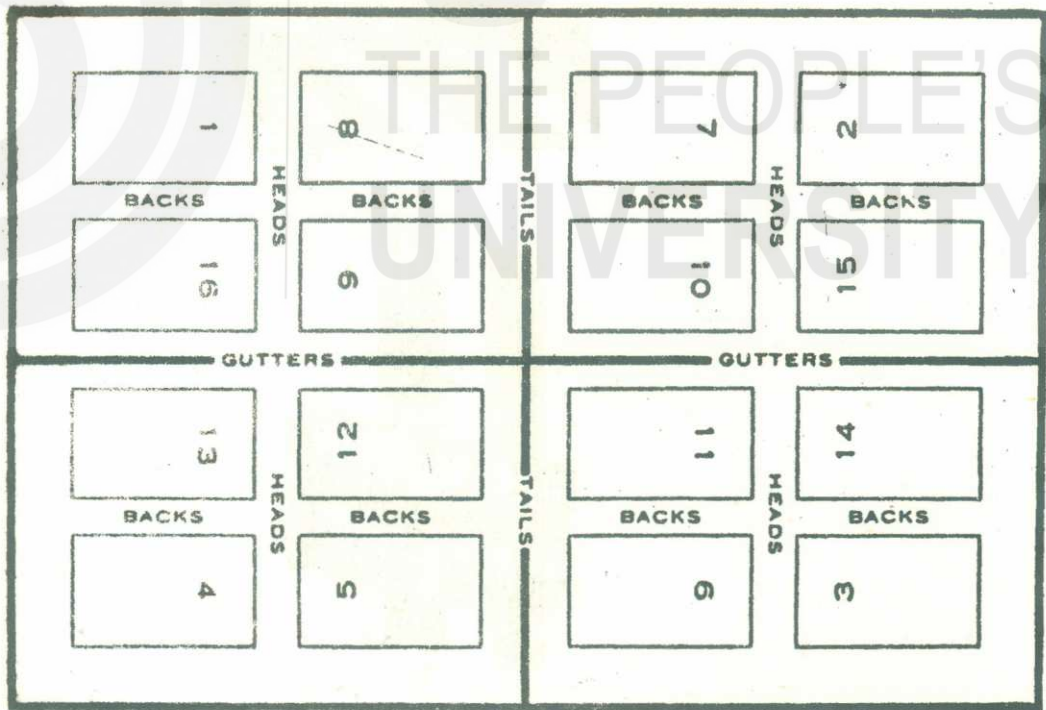


Figure 13 : Imposition of page negatives

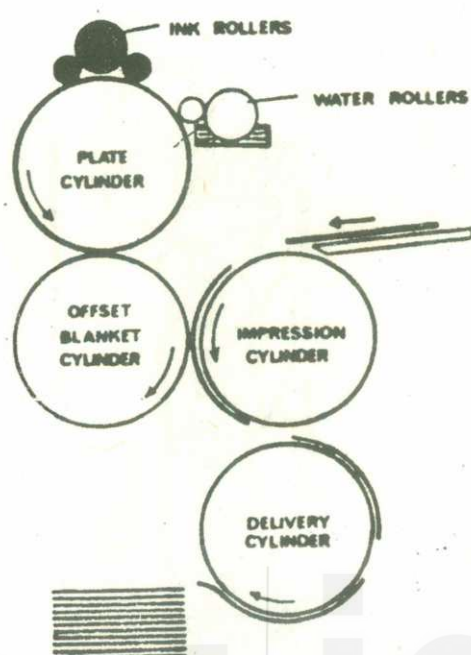


Figure 14 : The position of various cylinder of offset printing machine

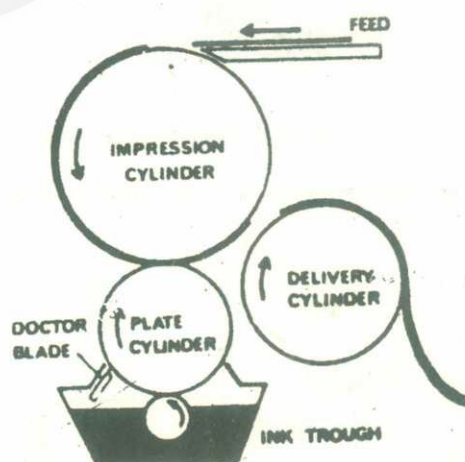


Figure 15 : Typical example of gravure cylinders

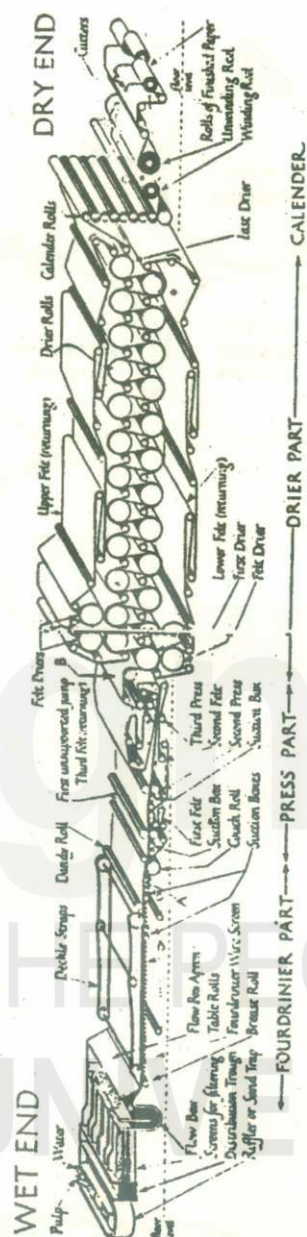


Figure 16 : Paper-making machine

Folio	4to	
	8vo	16mo
		32mo

Figure 17 : Sub-divisions of broad sheet.

UNIT 10 E-PUBLISHING AND NETWORK PUBLISHING

Structure

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- 10.1 Introduction
- 10.2 E-Publishing: An Overview
- 10.3 Evolution of E-Publishing
- 10.4 Categories of E-Publishing
 - 10.4.1 Commercial E-Publishing
 - 10.4.2 Vanity E-Publishing
 - 10.4.3 No-fee Distributors
 - 10.4.4 Electronic Self-Publishing
- 10.5 Print on Demand E-Publishing
 - 10.5.1 Print-On-Demand Myths
 - 10.5.2 Advantages of Print-on-Demand Publishing
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- 10.7 Kinds of E-publishing Products
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 - 10.7.2 Electronic Journals
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 - 10.9.5 Sales and Marketing
 - 10.9.6 Warehousing and Distribution
- 10.10 Network Publishing
 - 10.10.1 Network Publishing Technology
 - 10.10.2 Network Publishing Technology Providers
- 10.11 Future Trend of E -Publishing and Network Publishing
- 10.12 Summary
- 10.13 Answers to Self Check Exercises
- 10.14 Keywords
- 10.15 References and Further Reading

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10.0 OBJECTIVES

The developments in information technology have ushered in a new era in the field of printing and publishing. In the previous Unit we have already given you an idea of Desk Top Publishing. In this Unit, we will be discussing the publishing activities in electronic environment and how the publishing can be done in the digital and network environment. After studying this Unit, you will be able to:

- know what do the concepts of 'E-Publishing and Network Publishing' mean;
- know the evolution of 'E-Publishing and Network Publishing' and their basic functions;
- list different concepts related to such publishing as per their hierarchical relationship;
- study the pricing models of E-Publishing;
- understand differences between E-Publishing and Network Publishing; and
- identify their limitations.

10.1 INTRODUCTION

The advent of computers ushered in a new era in many disciplines. Information Technology has significant impact on the publishing industry too, paving the way for Internet and digital library throughout the World. In addition, computers as information processing systems have much relevance and offer many opportunities to the publishing sector. Ever since the introduction of computers, it has become a goal to many researchers to automate not only chores of routine work, but also the intellectual work of their respective fields. The field of printing and publishing is no exception.

The printing and publishing industry had come into existence after the invention of printing press with movable type by Johannes Gutenberg¹ in 1455. The technology enables the manufacture of high quality printed works at a fraction the cost of hand copying. With the passage of time literary, scientific, historic, informative works, observations and experiences of people are started to be recorded in the paper media rapidly. The society which could exist thousands of years without paper became paper-based rather paper-dependent society within a few years. There are sufficient reasons of major innovations like the rotary, steam-driven press behind these changes. With the emergence of many such analogous tools and techniques, the publishing and printing industry could be started to produce books, journals, newspapers, pamphlets, reports, other publications in a large scale to cope with the age of information explosion. More than 500 years of history of printing and its associated activities, publishing scenario is expanded and reasonably changed in comparison with what it was in the Gutenberg's age. In fact, scientists again started to debate for the paperless or less paper society. More over the significant development of Information technology and its applications in the field of printing and publishing world has undergone remarkable changes during last few decades. Within this period the concept of Desk Top Publishing (DTP) was emerged which is considered as little more than the logical extension of word processing (WP). And as time passes WP packages were able to adopt more and more DTP features while DTP package adopted more and more WP features. But recently exponential expansion of Internet has paved the way for electronic publishing (e-publishing). In other word, the Information Technology (IT) has altered the mode of publication in the form of attractive electronic sources. The new era of e-publishing has been started affecting producers, distributors, library and information centers and the users drastically. Developments and changes in the World of e-publishing can be used effectively to provide the users with pinpointed, exhaustive information at right time.

¹The first book produced by Gutenberg's printing press is the "Gutenberg 42-line Bible"

10.2 E-PUBLISHING: AN OVERVIEW

The generic term 'Electronic publishing' or 'e-publishing' is used to define the production of any that is published in digitized form. It uses new technology allowing publishers to deliver documents and other content quickly and efficiently as well. E-publishing is helpful in producing documents containing text, graphics, still or motion pictures, audio, video, tables, numeric, equations, or a combination of any or all of these with the assistance at a data processing system.

Electronic Publishing can be defined as any process which uses Information Technology to deliver information products in electronic form to an audience. It may involve the production of printed material, but more particularly the creation of CD-ROM and online products and services (reference material, electronic journals, specialized databases) which may be distributed and used without ever appearing in printed form. It may be carried out as a primary commercial concern (e.g., producing newspapers, books and magazines) or as a vital component of other organized processes such as administration, research, education, and voluntary public service.

Unlike traditional publishing, where the audience must be quite sizeable for the enterprise to be worthwhile, electronic publishing can enable any individual member to select exactly what he or she wants - potentially it is possible to appeal to an audience of one! At present the World Wide Web (WWW) provides the most visible and fast-expanding environment for these activities. Electronic presentation opens up many new possibilities for improving and extending access to information, but those involved in the publishing industry need a good mix of skills to use it effectively.

In other words, E-publishing is a computer aided or assisted process of publishing in which the documents are submitted in electronic form, edited, printed and even distributed to readers by employing computer and telecommunication networks; and the product of e-publishing may consist of abstracts, full texts, graphics, pictures, animations, sound, motion pictures and interactive features as well. Some scientists describe it as application of Information Technology to traditional print publishing and according to them the term electronic publishing refers more precisely to the storage and retrieval of digitized information through electronic communications media. So e-publishing can be represented as the combination of Information Technology and traditional publishing techniques i.e., e-publishing = Information Technology (= Computer Technology + Communication technology) + Publishing Techniques. The notion of publishing involves production of books, journals, reports, brochures, newspapers, pamphlets and directories on paper and print media. So long the printing is done mechanically only by printing machines. The use of computer technology in the production of printed materials is, perhaps, the initial stages of electronic publishing. Later sophisticated computer and telecommunication technologies added further impetus to publishing. Now electronic publishing covers not only the products of the print media, but also publishing of databases, development of multimedia products and even an interactive session with users all in electronic form. According to F W Lancaster, development of e-publishing had passed through different phases, like, the use of computers to generate conventional print-on-paper publications, distribution of the text on an electronic form, distribution in electronic form only, and generation of completely new publications culminating in hypertext and hypermedia. It causes major changes to the publishing industry, to our reading habit (the way we read) offering new hardware and software devices.

Since 1985 significant developments have taken place on electronic publishing. The concept of document on paper is being changed to 'electronic document' i.e., e-document. An e-document can be defined as the document existing in an electronic form to be accessed by computer.

Let us see the ramifications of e-publishing. E-publishing is a very broad term that includes a variety of different publishing models, including electronic books (e-books), print-on-demand (POD), email publishing, wireless publishing, electronic ink and web publishing. More types of e-publishing are sure to be developed in the near future.

Self Check Exercises

- 1) Who was the inventor of printing press?
- 2) What do you mean by e-publishing?

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

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

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10.3 EVOLUTION OF E-PUBLISHING

Since the invention of printing press many remarkable things were happened world over. A few of them are given here as a brief history of evolution in the field. In the year 1455, Johannes Gutenberg invented his famous printing press with movable type. And the first book "Gutenberg 42-line Bible" was produced by Gutenberg's printing press. The technology enabled the production of high quality printed document at a fraction of the cost of hand copying. This invention had changed the printing scenario and is considered as the landmark. After a few decades, in 1490, Aldus Manutius founded the Aldine Press in Venice. There were many changes and many printing presses that came into existence to start printing documents. Out of them remarkably, Abraham Ortelius produced the first modern atlas - Theatrum Orbis Terrarum in 1570 and slowly such productions could get the commercial advantages, contributors and associates started to earn. It is found that Alexander Pope, translator of the Iliad became the overpaid author in 1720.

The second landmark in this area as found is the production of wood pulp paper commercially for the first time in 1840. During this period, typesetting was done manually by hand at a rate of about 2000 letters per hour. In 1883, Tolbert Langston invented the first mechanical typesetting machine, called monotype. With monotype, letters were set at 6000 letters per hour.

In the last century, as it is noticed, the work of H G Wells had got importance. He wrote 'World Brain' in 1938. The World Brain is Wells' vision of a vast print encyclopedia of all human knowledge whose production company could become a new institution for knowledge and education. In 1945, Vannevar Bush wrote an essay to describe a device called the 'memex'. The 'memex' was of the size of a desk to store books and other materials on microfilm, and had the ability to link and connect passages among documents. Another important invention in the twentieth century probably was what we call Hypertext. The term 'Hypertext' was coined by Ted Nelson in 1965. Ted Nelson wrote also about his utopian project Xanadu in which all the works of the world are permanently stored in a universally accessible repository. In the same year (1965 AD) Marshall McLuhan, media prophet, predicted the coming impact and potential profit of the merging of electronic technology and books, as by that time the digital computer came into existence already, and emergence of computer technology based printing was started in the form of word processing. In 1968, Alan Kay created a cardboard model of the Dynabook - a computer with a million-pixel screen. This was basically a visionary device which Kay claimed as something more like super-paper. In 1971, the project 'Gutenberg' started to create a free

Computer Classics Library at the University of Illinois with the leadership of Michael Hart after he wrote 'Declaration of Independence'. At the end of 2001, the Gutenberg collection has crossed the 10000 titles. In 1979, Doug Adams released the popular science fiction novel, 'The Hitchhiker's Guide to the Galaxy', in which protagonist Ford Perfect researches the galaxy for a vast electronic book called *The Hitchhiker's Guide*. The *Random House Electronic Thesaurus* is arguably the world's first commercially available 'Electronic Book' (e-Book) which is published in 1981. This is another landmark for today's e-publishing. In 1986, Franklin Electronic Publishers embedded an electronic dictionary in a handheld device, producing the first portable e-Book. Barnes & Noble opened its first superstore in 1990. Sony's Data Discman was designed to display CD-ROM books on a 3.5 inch screen in 1991. With the blessings of Internet, e-publishing has got new dimension. In 1995, Amazon.com began selling print books on the web. In 2000, availability of Microsoft Reader with ClearType™ launched a new era of reading on screen. Recently, the map-book becomes an e-Book when the Library of Congress American Memory Project digitized the seventy maps and presented them on the web.

Self Check Exercise

3) When was the first e-book published?

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

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

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10.4 CATEGORIES OF E-PUBLISHING

During the last few years the e-publishing industry has spread over with increasing complexities and emergence of other concepts into it. The concept of 'e-publishing' covers a variety of publishing models and formats. E-publishing models include commercial e-publishing, subsidy e-publishing, 'distributors', and self e-publishing.

10.4.1 Commercial E-Publishing

The function of Commercial E-publishing is much like commercial printing & publishing. Manuscripts are accepted on the basis of quality and marketability. Most commercial publishers then go through the same process of review, editing and proofreading before publication as a print publisher. It has been found that most commercial e-publishers also accept fewer than ten percent of submissions. While authors do not receive an advance, but they do receive royalties (often as high as 40 percent), and do not pay anything toward the cost of producing the book. In other words, writers pay no fee for publication, but receive royalties.

Commercial e-publishers typically sell their books through their own Website, as well as through Amazon.com, Barnes and Noble, and other electronic bookstores. Some produce editions for hand-held e-readers and other hand held formats (such as the Palm). Some are also available through Barnes and Noble's real-world outlet, in the form of Rocket

Editions (downloadable for the Rocket Book e-reader). Some offer both electronic downloads and disks or CD-ROMs, and some also offer print-on-demand services. Most provide such service as obtaining ISBN numbers, copyright registration, and sometimes also a LC (Library of Congress) listing. It is generally possible to order a commercially published e-book by ISBN through a bookstore.

Self Check Exercises

- 4) What are the publishing models used in e-publishing?
- 5) What do you mean by trade publishing?

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

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

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10.4.2 Vanity E-Publishing

Vanity Publishing is sometimes called as a subsidy publishing since the author pays a subsidy to get a book published. Subsidy e-publishers, like their print counterparts, produce and distribute books for a certain fee per manuscript. Authors receive a royalty, which is usually comparable to that offered by commercial e-publishers (around forty percent). Many subsidy publishers have a range of extra charges – such as charges for formatting the book if the author has not done so, charges for illustrations, cover designs, editing, an ISBN or copyright registration, etc. These charges can add up quickly. Like commercially published e-books, subsidy-published e-books are available through most online bookstores. They are less likely to be available in a downloadable Rocket Book edition, and very rarely found in traditional bookstores. As they have ISBNs, they can be ordered from any bookstore.

In spite of many positive promises of vanity publishing, there are some problems in it. Authors do not rely on a subsidy press to edit, proof read or otherwise contribute to the quality of a manuscript.

Thus, one form of subsidy publishing that is becoming increasingly popular is *print-on-demand* (POD) publishing. More about POD publishing is discussed in later section in this Unit.

10.4.3 No-Fee Distributors

A type of e-publishing that is difficult to categorize is the publisher who accepts electronic manuscripts as it is, usually already formatted by the author, and provides it to a bookstore where those books can be purchased. Generally, such a distributor charges no fee to the author, but takes a percentage of royalties (usually around twenty-five to thirty percent). A distributor generally does not get involved in editing, designing or producing the document and the author can usually set the price (though the distributor may have a minimum price limit). Some distributors, like *Booklocker.com*, are highly selective about what books they will offer for sale; others accept most manuscripts.

10.4.4 Electronic Self-publishing

Electronic Self-publishing is a process in which the author is entirely responsible for producing his/her own book, from development to publication to marketing. Many authors choose to electronically self-publish their manuscript. In self-publishing, the author formats the text (or arranges for formatting), and is responsible for obtaining the ISBN and copyright registration. This offers an inexpensive alternative to print self-publishing – for the obvious reason that one does not incur the huge cost of getting one's book printed. Most often, a self-published e-book will be posted upon or sold through the author's own site rather than that of a publisher i.e., a self-published e-author generally does the majority of marketing via the Web on his own. A self-published author receives all revenues from book sales, rather than a percentage of revenue in the form of royalties. Self-publishing is a viable option for many. This method places one in complete control of the entire process. Most self-published e-authors publish document in PDF or HTML format. Self-published e-authors are also eligible to participate in *Amazon.com*'s 'Advantage' program; however, they must be able to provide a disk version of the book, with an ISBN.

There is a difference between subsidy publishing and self-publishing. The primary difference is in ownership. A self-publisher owns all rights to his or her book; no rights are licensed to another publisher. A subsidy publisher, however, receives a license of rights just like a commercial publisher. Another key difference is revenue – the self-publisher receives cent percent of book sale revenues, while the subsidy-published author receives only a percentage of those revenues in the form of royalties. The self-publisher also retains complete control over the book – its cover, its design, its marketing process, its price and discounts – while the subsidy-published author may not have any say over these matters.

Self Check Exercises

- 6) What do you mean by subsidy e-publishing?
- 7) What do you mean by self-publishing?

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

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

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10.5 PRINT ON DEMAND E-PUBLISHING

The Internet has provided writers a new way to reach vast audiences and promote publishing e-books. This has much greater impact on the book business than technological advances in publisher workflow, but has been largely ignored by most authors and publishers. The new pre-press software allows a skilled operator working on a home PC to produce the electronic files for printing books that are indistinguishable from the best. On-demand publishing allows publishers to print commercially competitive books a single copy at a time- a true revolution in the basic publishing model. This is considered as a form of electronic (or digital) publishing in which a book is submitted to the publisher electronically, and is stored as an electronic file, to be printed out in book format only when it is actually ordered by the customer. The very newness of these innovations ensures that no one is

currently using them all to the best possible effect. This means that there is more opportunity than ever for both new and established authors to start a publishing company. Many publishers offer both electronic and print-on-demand editions of the same book. While a handful of commercial publishers offer both print-on-demand and electronic editions, most POD publishers are subsidy publishers.

POD publishing is getting popularity in case of self-publishing. Anybody who prints a bunch of pages using their computer and printer, punches holes in the margin and arranges them in a spiral-ring binder, can perfectly claim themselves as self-publisher. But as far as the industry is concerned, a publisher, whether a person or business company, should have obtained at least one ISBN (International Standard Book Number) block.

In addition, POD in self publishing is considered as a unique new model which has come into its own with the Internet. While the processes followed in preparing new titles for traditional publication on offset presses can also be applied to POD, the traditional publishing process evolved over hundreds of years, dedicated to making the peculiar economics of that industry feasible. POD does not obey the economics of traditional offset publishing, though many publishers have been slow to realize this. Now-a-days, anybody can set up a publishing company for publishing e-books and make them available through bookstores like Amazon.com with a minimal cost. That cost generally does not include the same for writing, editing, proofreading or marketing, but it does include the cost of an ISBN block and print-on-demand title setup.

10.5.1 Print-On-Demand Myths

Morris Rosenthal in his book entitled *Print-on-Demand Book Publishing* identifies the following four myths and dismissed them with strong fact based arguments:

- 1) The most prevalent myth about print-on-demand is that books published with on demand technology are unwelcome in bookstores and libraries. Nothing could be further from the truth. In fact, the world's major academic presses are some of the heaviest users of print-on-demand. The factors that keep any new book from gaining a place on bookstore shelves are: *lack of marketing, lack of demand, the publisher's refusal to accept returns, the publisher's refusal to grant the trade discount, or an unprofessional appearance.*
- 2) The second widely believed myth about on-demand books is that they are amateur productions put on by subsidy publishers. The technology used to print a book has no bearing on the production values, which result from a combination of writing, editing, proofreading and design. The quality of the paper stock and cover printing for POD books varies with the provider, just as it does with offset printed books.
- 3) The third myth says that a self-publisher would choose print-on-demand book publishing only if they planned to print less than a hundred books a year. As it has been proved by performing case studies that on-demand printing can actually be cheaper for publishing books in quantities up to 500 or more copies at a time, and allows an order turn-around time of days rather than weeks. A book that only sells hundred a year is not a compelling commercial product for any publishing company, unless the cover price is astronomically high.
- 4) The fourth myth is that the print-on-demand book publishing equals vanity publishing. The truth is that practically every major publishing company in the country is starting to utilize POD for some portion of their backlist. This myth is probably the most damaging to 'On Demand Publishing' as a branding expression, since it has become associated with the vanity press business in the minds of most people working in the book industry. However, there's no reason for a customer to care about the technology used to create a book, unless the publisher wants to make the argument that on-demand book publishing is 'true friendly.'

10.5.2 Advantages of Print-on-Demand Publishing

Keeping the myths aside, POD publishing offers the following advantages to authors:

- i) **Low Cost** : This form of e-publishing helps in storing the manuscript as an electronic file until a customer places an order. In response to an order, the book is then printed and delivered. Since books are printed only when ordered, POD publishing avoids the massive up-front cost of printing several thousand copies. However, production of a considerable number of copies would be cost effective. In addition to the e-book, a customer can still obtain a hard copy of that book, complete with a professional cover and a well-designed layout.
- ii) **Easy Production** : Many authors have found that if they offer customers the option of an electronic download or a POD edition, the majority will order the POD version. This suggests that most consumers still prefer a printed book to an electronic file if they are given the choice. Print-on-demand is also a good alternative for someone who basically wishes to self-publish, but wishes to avoid the costs associated with producing a printed book.
- iii) **Reviving Out-of-print Book** : Many authors have also found that POD is an excellent way to revive out-of-print books. The Author's guild (<http://www.authorsguild.org>) offers its members a program through which out-of-print titles can be reissued in POD format, and such titles often sell extremely well. It is worth noting, however, that these titles and authors generally have a proven track record of sales, and quite often an existing readership.

Self Check Exercises

- 8) What do you mean by POD?
- 9) What are the advantages of POD?

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

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

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10.6 E-DOCUMENTS

Recently it is found that much of the information are in-born electronic. They may be either of textual only or of multimedia presentation. Multimedia is an integration of text, graphics, audio, video and animation on a single hardware platform. In multimedia the information is organized linear. But once the multimedia program is developed in a hypertext environment i.e., the information fragments are linked nonlinearly from one element to other, either within the same system or among the remote systems, it becomes a hypermedia. Now-a-days, multimedia products are usually available with hypermedia elements. Several reference sources such as dictionaries, encyclopedias, directories, and year books are now available in multimedia formats. The development of multimedia technologies have vast implications for information access and retrieval as they possess enormous potential

to store and integrate information contained in different media. The interactive nature of multimedia has been a boon to the end-users who feel that everything is happening in front of them. Electronic information is stored in e-documents or media. Just like the print media are meant for hard copies of usual books, journals; a special type of media i.e., the electronic media are used in e-publishing. Basically computer storage media are mostly used for the purpose. There are many of such types like tapes, disks, etc. The most popularly used physically storage devices are optical disks

10.6.1 Optical Disc as a Product

During last few decades, the optical storage media could get their popularity due to their storage capacity. The mode of storing all types of data on a single disk is through digitizing information. Of them, CD-ROM (Compact Disc Read Only Memory) is a well-known permanent optical based storage medium for the storage and distribution of large volume of information. Generally the information stored in CD-ROM can be read, and cannot be erased or overwritten (in case of CD-R), but if required erasable disks (i.e., CD-RW) can also be used. To read a CD-ROM, one needs a CD-ROM drive (or Reader) which is a computer peripheral device attached with Computer. Due to its tremendous storage capacity and long shelf life, CD-ROM seems to be an ideal medium for backup and archival of data. Almost all publishing products such as full texts, abstracts, catalogues, directories, etc. are now available in CD-ROM. CD-ROM networking are now in vogue to facilitate several end-users accessing the CD-ROMs at a time, in contrast to earlier products which facilitated only 'single-user' mode of data access. Of recent, a high density disc, known as Digital Versatile Disk (DVD) has been developed, which has a capacity of storing seven times data onto the same surface area as that of the CD-ROM. DVD has a great potentiality for storage and distribution of large amount of data in electronic form and is able to expand new horizons of information dissemination in future. In case of multimedia, all types of data are stored through digitizing all the forms (medium) of information. Videotapes, Video disks (available on CD-ROM, DVD), etc. are some of the commonly available multimedia products. A multimedia computer system, known as Multimedia PC or MPC, supported with graphic processor, sound card, video capture card, CD-ROM drive and a set of sound blasters is required. The documents in the multimedia are stored either in high capacity hard disks, CD-ROMs, or DVD-ROMs to save storage space. Advantages of CD-ROM/ DVD-ROM disks are their portability. However, e-documents include from downloadable books to journals that can be transferred from a source to local computer. The source of e-documents may be a handheld e-book reader, books on disk or CD-ROM; and/or documents those are printed out in *print-on-demand* format. They are available in a wide range of programs, including PDF, HTML, XML formats tailored for handheld devices, and in even less popularly used .DOC file formats.

Self Check Exercise

10) What is an e-document? What is the popularly used media for its presentation?

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

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

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10.7 KINDS OF E-PUBLISHING PRODUCTS

10.7.1 E- Books

Electronic books are also known as e-books. E-books are electronic version of books, delivered to readers in digital formats. They are read on all types of computers, including hand held devices designed specifically for reading e-books. Hence an electronic book should have electronic text and that text is to be represented to the reader visually. The electronic text is either saved to a floppy disk, transferred onto a CD-ROM, downloaded from the Internet or built into a palm-sized digital reader. There are a large number of devices being developed to make reading e-books easier for consumers. E-books can be as familiar as their print counterparts or as unique as the electronic medium itself, containing audio, video or live hyperlinks.

Special software, which makes documents or pages of a book easier to read on a screen, is also being developed by software companies. A standard for e-book software, known as the open e-book standard, or OEB, has been developed as a standard format for e-books, but competing standards such as Adobe's PDF exists. E-books can be delivered by download or e-mail attachments.

Project Gutenberg of University of Illinois is one of the famous publisher of book length electronic texts, began in 1971. By the end of 2001, this publisher has created and distributed more than 10,000 electronic texts, which include several main categories of books including classics, light literatures and reference books.

Major Steps in Creation of E-Books

E-books have definitely become the buzzword among authors and publishers. They are worried to create e-books which are inexpensive to produce, and can be updated or changed in a flash.

The **first step** of creation of e-book is to decide about the software product to be used to package the e-book. Right now the major choice of e-book publishers is Adobe Acrobat available on <http://www.adobe.com>. Acrobat makes an e-book perfectly formatted on the customers screen. In other words, if a word processor like MS-Word is used to format the book's layout, Acrobat would maintain the look of the file for the person reading. Acrobat-created documents are accessible to customers with both PCs and Macintosh computers. Most other programs do not provide this option. But it is important, as it allows serving the maximum number of buyers.

Another option is to create e-book as an HTML file, a language used for Web pages authoring. This method gives an opportunity to make e-book a multimedia production, with animation, audio, video. HyperMaker can produce executable .exe file after compiling all HTML files. HyperMaker also enables e-book password protected, so that only a chapter or two is free. This way a potential buyer is allowed download a portion, copy, read a bit, and order immediate access if they want. The downfall to producing HTML e-books is that they are normally only readable to customers with PCs.

In the **second step**, the created e-book is to be made 'download ready'. This means that the e-book's file size should be smaller so that it downloads quickly onto the customer's computer. WinZip (<http://www.winzip.com>), is a popular compression program that makes this task very easy. This user-friendly software is very simple to use. It does every thing on behalf of the user once files to be compressed are selected. A file is created with an extension .zip (e.g., ebook.zip) to let user know that it's a zipped or shrunk file. Now as the e-book is zipped, there should be one way to decompress or unzip the file without WinZip. This means the zipped e-book file has to be transformed into a 'self-extracting' zip file. This facility is available with WinZip. In this way, even if the buyer does not have a zip program pre-installed on their system, the file will still open.

The **third step** is to upload the zipped e-book to the Web Server. It is same as uploading a web page to the Web Server. Now the documents address would be the adding of the

zipped file name after the website address. For example, the website address is <http://www.ignou.ac.in> and the e-book file name is [ebook.zip](#), the complete download address would be <http://www.ignou.ac.in/ebook.zip>.

Reading Software and Hardware for E-Books

E-books come in a variety of different flavours, for instance, certain e-books are read on handheld devices like the Rocket Book Reader <<http://www.rocketbook.com>>. Mega bookstore BarnesandNoble.com sells e-book titles in this category. This software can be downloaded directly from the Internet onto the customer's computer. The customer then has the option of reading the e-book on screen, or printing it out.

The following file formats are used for e-books:

- .DOC files are read with Microsoft Word or WordPad. DOC files are also compatible with the SoftBook Reader reading software and device.
- .HTML files are read with Internet Browser software, which is pre-installed on most computers and available as a free download. HTML files are compatible with the Rocket eBook reading device.
- .OeB is the Open eBook Standard format. SoftBook Reader and Microsoft Reader can read OeB compatible files. Rocket eBook is also compatible with OeB.
- .PDF files are read with Adobe's Acrobat Reader or the Glassbook Reader, both available as a free download.
- .RTF is considered the Universal file format because it works with any word processing program, PCs and Macs. WordPad or a word processing software package is needed to read .RTF files.
- .TXT files are called Plain ASCII text. Any ASCII editor based on Windows or DOS may be used to read them.
- .WPD files are read with Corel's Word Perfect.

Hardware or reading devices are also important. The new generation of digital reading machines abandons the protocol that has defined the age of computing - scrolling - in favour of presenting text like a bound book; that is, it's a codex or sequence of pages. After years of punctuating the reading of every three or four paragraphs on a screen with a turning away of the eyes as the text rolls upward, there's a relief in simply clicking a button to get virtual page. The latest machines come with other refinements as well, such as electronic book marking, so one can automatically return to the page of last reading when the reader turns on again. The better quality machines also come with a built-in stylus, with reader annotation.

Self Check Exercises

- 11) What do you understand by e-book?
- 12) What file formats are used in e-books creation?

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

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

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10.7.2 Electronic Journals

Electronic journal, e-journals in short, is a serial, produced, published and distributed in electronic media. Basically e-journal is one which is available in electronic form and can be accessed using computer and communication technologies. Often e-journals are called virtual journals, paperless journals, online journals, scholarly electronic journals, networked journals and CD-ROM journals, etc. Generally they are full text delivery systems and differ from conventional online bibliographic databases. All the activities of publishing from the initial stages of paper submission to publishing and distribution including accessing are performed using electronic media. With the emergence of Internet the prominence of e-journal has enhanced greatly. Electronic journal saves considerable time and effort on the part of authors, users and publishers.

Evolution of E-Journals

The concept of e-journals was conceived with the full text databases offered by DIALOG in 1980. Dialog provided with only ASCII files of the journals, which stripped off the diagrams, photo, graphs from the text. With the advent of CD-ROM and allied technology it is possible to record and deliver full text of the journal as image file. During the year 1990 the online vendors started to deliver instantly the full text using CD-ROM and FAX. But they were unable to deliver any journals due to copyright issues. BHIL (Bell & Howell Information and Learning) successfully promoted this technology models for journals and offered LAN based solution with its image files of full text CD-ROM database of journals in the area of management, medical and social sciences. Later, ADONIS (Advanced Documents Over Network Information Systems) and IEEE followed the same LAN based models.

Major landmark in the world of e-journals is found with the advent of Internet. Many publishers are using the Web as a global way of offering their journals to international community. Of late, e-journals become the transformation of the Internet version available with different file format like HTML, SGML, PDF (Portable Document Format) image having facilities as a searchable file. During the last few years, scholarly electronic journals have been changed a lot making a great impact among researchers and information professionals. In the 21st Century, publishing and citing e-journals have increased. For years publishers have been providing full-text access to a number of journals on CD-ROM, which requires a significant amount of hardware, time, and technical expertise on the subscriber's end. Libraries are experiencing declining trends in investment on acquisition of content. More so, declining trend is seen in investment on print versions. Spending for books has been particularly hard hit, while spending for online services and CD-ROM is showing a steady increase. Journal subscriptions have followed the same pattern, as well. Online and CD-ROM journals pose certain problems in terms of access. The scheme, in which electronic journals are made available to the subscribers, ensures that the powers of access and preservation remain in the hands of the publisher. Ease of accessing web prompts both publishers and scholars alike to put their contents on the web and the primary formats used are HTML, PDF, and increasingly, XML, and this has its own consequences for the professionals.

In under-developed and developing countries its viability, with the existing infrastructure and pricing, has been viewed with great apprehension. Many ask whether e-publications are operated at much lower costs than print journals, and at the same time provide all the benefits of print journals. Lots of studies obviously come from developed countries but still do not provide a total and convincing solution to the problems expressed by readers and the library professionals. E-journals have almost all the characteristics of the print journals and would be available either online or offline or both.

Types of E-Journals

Three types of electronic journals are available: i) online journals which are basically the online versions of the print journals; ii) CD-ROM journals which are full text journals published and distributed on CD-ROM media periodically and iii) networked electronic journals published and distributed via the Internet.

- a) **Online journals:** These Journals are available on 'pay-as-you go' or 'cost-per access basis' via online hosts or vendors. Important online hosts providing online journals are OCLC, Dialog, Bibliographic Retrieval Services (BRS), STN International, etc. Due to high cost and limited access of the users to remote online systems, online journals are not generally considered as a part of the library collection. Electronic versions of some of the existing printed journals are also available. For example the journals of the American Chemical Society are available online through the STN International.
- b) **CD-ROM Journals:** These are full text journals published and distributed in the form of CD-ROM at a different frequency along with a search software to access and print. Mostly they are the electronic versions of existing print journals. Numbers of publishers (both commercial and learned society) have started publishing some of their core journals in CD-ROM form. Important examples are the journals and conference proceedings of IEEE, ABI-INFORM, a full text business periodical published by University Microfilm International and ADONIS published by Elsevier Publishers.
- c) **Networked e-Journals:** These are the electronic versions of existing journals or only electronic version available over the network either on or any other commercial smaller networks. Internet has enabled the publishing task much easier and faster. Many printed journals are available in electronic form over Internet either free of charge or on subscription. Many journals have no print versions and are available only on the Net. The number of e-journals available on Internet has increased rapidly over time. They are based on mailing list software or client/server computing applications including www. These can be newsletters, discussion lists, un-moderated bulletin boards, peer reviewed journals and popular magazines. The networked e-journals can be distributed by the following ways:
 - i) **Contents page and abstracts**

The central computer holds a list of subscribers and sends them contents page and abstracts of articles by e-mail of the newly published issues. The subscribers can retrieve the relevant articles through file transfer protocol (FTP) or GET command using e-mail itself so that the articles are delivered to their e-mail boxes.
 - ii) **Full text delivery**

Subscribers are automatically sent the full text of each newly published issue by e-mail.
 - iii) **Client/server technology**

Numbers of e-journals are now being published with the application of client/server technology. For example e-journals can be accessed via Gopher, where a desktop gopher client connects to a gopher server and via www where a desktop client such as Mosaic, Netscape connects to web servers. The method has been found to be very useful for accessing e-journals in recent years.

Self Check Exercises

- 13) What is e-journal? And what are its type?
- 14) What are the ways of distributing networked e-journals?

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

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

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Of all types, network e-journals are most popular and easily accessible. They are used almost synonymously to e-journals. Now-a-days, an e-journal is referred generally to a networked e-journal. There are three access models to e-journals:

- a) **Remote Access:** Publishers host their journals at their website. Access Permission is provided, when the library or individual subscribes to the e-journals. Publishers offer the rights through one of the following methods:
 - i) **User ID and Password:** The subscriber gets a user id and password, which can be used from any user terminal in the library. This is suitable for dial up access users.
 - ii) **IP enabled (Intranet) :** This method can be used by the libraries who have Intranet based LAN in their libraries or campus. Here publisher's server site will recognize and validate the IP address of subscriber's Intranet server when a user logs into publisher's website for a subscribed journal.
 - iii) **Combined:** Both of the aforesaid access methods are also offered by the publishers.
- b) **On Site Access:** Publishers deliver the e-journals to subscribers through CD-ROM or through their website or FTP option. This is more suitable than above methods because it is more secure to maintain the journal at its end as it has paid for the journal (the library) and is used to the ownership concept. As library can host the journal within its campus through LAN it offers wider and better bandwidth for access than access through Internet.
- c) **Access through Database:** The access and use of information in an electronic/digital format is not a new concept. Some publishers have been producing their content in an electronic format for years. Access models offered by publishers limit the access to their journals, but the users often find articles of their interest through database.

The bibliographic databases have emerged as user's favourite/preferred interface for searching and locating information. Seamless access to information is achieved through the link model offered by database producers and vendors.

Advantages of E-Journals

With the emergence of Internet, the publication of e-journals has brought the following advantages for both libraries as well as to the user community:

- i) The speed of publication and delivery of the journal issues is much faster than the print versions.
- ii) Inclusion of audio and video base text in the journal issues is possible.
- iii) To access and retrieve relevant articles, a good number of search engines are available.
- iv) Downloading and printing of relevant articles at the end user workstations is possible.
- v) E-journals have solved many problems of libraries such as space, shelving, missing issues, missing pages and cutting of the pages, etc.
- vi) Multiple access and access through local networks becomes easy.
- vii) Provide hyperlinks, i.e., links to the related articles cited in each article and other useful sources.
- viii) Help in minimizing the problems related to the conservation and preservation of journals.
- ix) Cost of publication and distribution is less than the print versions.
- x) Alerting the users regarding the publication of new issues and articles of their interest becomes easier in electronic media.

Limitations of E-Journals

With the increasing popularity of the e-journals, its publication has come across with many limitations which need to be considered. Due to the emergence of Internet the following factors cum constraints concerning the usage of e-journals are to be taken care:

- i) *No Ownership*: The subscriber, whether it's a library or an individual, becomes the owner of a printed journal which is not possible in case of e-journals. So the concepts like 'library has' or 'library has not' is no more in existence for e-journals. A major shift in case of e-journal is concerned not with owning it but having permission to access it. Most of the publishers of e-journals maintain a limited period (say one year) for accessing them, and accessing beyond that period means paying extra charges. The library or the user has to pay for accessing the journals rather than owning them.
- ii) *Infrastructure*: The subscribers of the e-journals require the necessary computer with Internet facilities to access, download and preserve them which may not be possible for all the libraries or users. Cost involved in creating the entire infrastructure, network connection and printing may be deferent in using e-journals.
- iii) *Archiving*: Till today many libraries are not updated with new technological applications. In fact many of them find it difficult to cope with the technology. E-journals, especially issues for several years with back runs require large disk space to store and archive, and some libraries have limitations in this respect. Even if the data are stored, retrieving, providing printouts on demand, upgrading the retrieval software, etc. are some of the problems that the libraries encounter.
- iv) *Standardization*: Production of e-journals generally lack clear-cut standardization regarding its format and the software associated in accessing them. E-journals users should be acquainted with the technical know-how associated with them, which is not possible in all cases. Some of the e-journals do not include page numbers as the size of the page varies according to the display area of different computer (except pdf file). This raises citation problem when the same material to be cited can appear in different pages. This necessitates training of library staff and users which creates problems to the library and takes considerable time and effort.
- v) *Acceptability*: In spite of tremendous technological innovations and their applications to digitized information, many people are strongly in favour of paper media. Hence, librarians, authors and users are yet to accept e-journals as viable alternative to print versions. Perhaps it will take some more time for the users of e-journals to realize the full advantages of e-journals.
- vi) *Mode of Subscription*: For print media journals, they are selected based on certain procedures like asking for quotations, sample issues and evaluation, etc. by the libraries before they are being procured. Some e-journal publishers offer free trial subscription for a period. The procedures for procuring e-journals are to be changed or modified accordingly to make them suitable. Even for browsing an e-journal the user has to pay for it which the user may not always like to do. A well-accepted method of subscription has not yet been achieved.
- vii) *Scrolling*: Computers cannot display a full page at a time and need scrolling of the screen for browsing which is very uncomfortable for a reader. It is not possible to browse through a digital document without accessing it.
- viii) *Bibliographic control*: No suitable bibliographic control mechanism is available for e-journals. It becomes difficult for a user to identify a particular e-journal or even to be aware of the publication of e-journals over the network.

Despite several problems, the e-journals are very popular particularly because of the possibility of the multimedia and hypermedia linkages among the electronic resources which is not possible in print versions. The librarians should be prepared to handle them to make them easily accessible to the users.

15) What are the access models of e-journals?

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

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

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10.7.3 E-Zine

An E-zine, also known as an email magazine, online publication or electronic newsletter/magazine is simply a newsletter, stored on a file server, distributed or accessed via email and/or online. It is also called Web-zine. There are thousands of e-zines on various subjects available on the Internet free of charge. Some of them are www.indiatoday.com, www.musicindia.com, www.bestindiansites.com, www.news.sify.com, etc. Having an e-zine will enable to keep in touch with different visitors as well as to build a huge database of several contacts of potential customers which help in marketing on the Internet. In addition, it can eventually bring a nice income selling sponsor advertising and classified advertisements. One can publish an e-zine completely free. There are many list servers such as; E-groups (<http://www.egroups.com>), Onelist (<http://www.onelist.com>) & Listbot (<http://www.listbot.com>) those allow hosting the list (e-zine) free of charge taking care of all subscription requests. To use one of these list servers, simply sign up and instantly create the list. They will provide with email address to subscribe/ unsubscribe and even a list-owner email address. All are completely free. The only disadvantage is that each posting will contain an advertisement for their service. This is really a small price to pay for such a great service.

- a) **Contents of an E-Zine:** A quality e-zine should contain at least some original content. For developing writing habit, it freshens up your writing and grammar skills and presentation techniques. Many websites are available:

Garbl's Writing Resources Online	http://pweb.netcom.com/~garbl1/writing.html
Rules of Writing	http://www.junketstudies.com/rulesofw/
Exploring English	http://www.shared-visions.com/explore/english/
Simpler Words And Phrases	http://www.smartbiz.com/sbs/arts/tpl5.htm

In addition, there are some resources for obtaining free content for publication. However, before using any articles, necessary precautions and/or permission of authors to publish articles must be sought to avoid problems related to copyright issues. Most articles for publication can be used in e-zine free of charge as long as the author credits or resource box is included. For free contents the following websites are useful:

Announce - Writer & Publisher Exchange	http://www.web-source.net/article-announce
E-ZineZ.com	http://www.e-zinez.com/
Marketing & Advertising Super-site	http://drnunley.com/
BizWeb2000	http://bizweb2000.com/articles.htm
Success Doctor	http://success-doctor.com/archive.htm
IdeaMarketers	http://www.ideamarketers.com/

- b) **Subject area:** The e-zine should focus on a subject area in which it has a great deal of knowledge. It should focus the theme of the website, if any. For example, if your website is related to *Internet Marketing*, you would not want to have your e-zines focussed to be on *Animals & Pets*, rather you would want it to be on *Internet Marketing*.
- c) **Title:** The title of your e-zine is one of the most important decisions you can make. The title should be an expressive, catchy and should have been planned to be placed at the beginning of the list. On the other word the title should sound intriguing and tell your potential subscriber exactly what the publication is all about. This gives the publication an advantage over the publications listed below. Potential subscribers will see the e-zine first and be more apt to subscribe.
- d) **Frequency:** Frequency of the e-zine publication may be fixed as per the demand of the subscriber considering all other factors. For example, at the beginning it may be published monthly, and may be increased to bi-weekly or weekly whenever it is warranted.
- e) **Size:** There has been a great deal of controversy over the size of an e-zine. The size really does not matter, if the content of the e-zine is of high quality. If it is too large, subscriber may face it difficult to download. Consider may be one of the solution or crudely it may be separated in to parts.
- f) **Website:** It is always highly recommended that the e-zine have its own website. It has many advantages like an own site will enable you to give visitors an in depths look at exactly what your publication is all about, it will be possible to highlight upcoming editions, polls, archives and a subscription box to allow visitors to easily subscribe.
- g) **Style & Format:** The appearance of e-zine is one of the most important factors in determining its success. Getting subscribers is the easy part. Keeping them will entail a little work. A professionally written, well designed, content rich publication will ensure the e-zine's success.

Regular word processors are not a good choice for writing newsletter and e-zine as well due to formatting issues. Notepad is good enough to write in plain text which is easily available. Another consideration of great importance is line length. If the text lines are too long, the text is viewed as in different way (broken lines) by some email programs that are not capable of viewing long text lines. As a rule, a generally safe line-length is 65 characters (including spaces); as you begin typing text, when you reach 65 characters, use a hard return. It is highly recommended that a sample copy should be reviewed prior to sending it to subscribers. By viewing the publication in this manner it will possible to correct any formatting problems.

Self Check Exercise

- 16) Write a brief note on e-zine?

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

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

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10.7.4 Electronic Theses and Dissertations

An ETD (Electronic Thesis and Dissertation) is a document self explanatory by its name that is prepared as a result of research work carried out by students of post-graduate course or research degree. It is presented in a form simultaneously suitable for machine archives and worldwide retrieval. A rather related project should be mentioned here. The Networked Digital Library of Theses and Dissertations (NDLTD) is a collaborative effort of universities around the world to promote creating, archiving, distributing and accessing Electronic Theses and Dissertations (ETDs). Since its inception in 1996, a large number of universities have joined the initiative, underscoring the importance institutions place on training their graduates in the emerging forms of digital publishing and information access. The outreach and training mission of NDLTD is an ongoing project. Recent research has focused on creating a union database that will provide a means to search and retrieve ETDs from the combined collections of NDLTD member institutions. In response to the need for a focused and accessible catalog with a low barrier to participation, NDLTD has adopted a solution that uses the Open Archives Initiative's Metadata Harvesting Protocol (OAI-PMH) to gather metadata in the ETDMS format and then to make it accessible at a central portal. NDLTD project has international members from over a dozen countries sharing electronic theses and dissertations.

As has already been mentioned that the ETD provides a technologically advanced medium for presenting ones ideas. ETD is prepared using nearly any word processor or document preparation system, incorporating relative multimedia objects. Consequently ETDs are less expensive to prepare, consume virtually no library shelf space, and never collect dust. At users' choice, they can be available to anyone that can browse the World Wide Web. There are many websites for ETDs, the following are a few to name:

<http://www.theses.org>

<http://www.vidyanidhi.org.in>

<http://ohiolink.edu/etd>

<http://etd.iisc.ernet.in>

<http://www.unesco.org/webworld.etd/contribution.html>

<http://scholar.lib.vt.edu/thesis>

<http://www.moe.edu.sg>

10.7.5 E-Reference Sources

Hundreds of websites dealing with reference resources are available on different websites. Of late vendors and publishers are providing users with various reference sources through their websites and databases, such as dictionaries, yearbooks, encyclopedias, etc. It is not possible to enumerate them all here, a few of them are here, as examples.

Atlases & maps <http://www.atlapedia.com/index.html>

Dictionaries online <http://www.dictionary.com>

<http://www.m-w.com>

<http://www.dict.leo.org>

<http://www.battleby.com>

http://humanities.uchicago.edu/forms-unrest/webser_form.html

<http://www.answer.com/reference.com>

Directories online	http://www.people.yahoo.com
Encyclopedias online	http://www.eb.com http://www.mhreference.com/EST/est.html
Handbooks online	http://www.ntu.edu.au , etc.
Thesaurus online	http://humanities.uchicago.edu/forms-unrest/ROGET.html
Quotations online	http://www.columbia.edu/acis/vartleby/bartlett/
Yearbook online	http://www.uia.org

Self Check Exercise

17) What do you mean by ETD? Give names of such sites.

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

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

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10.7.6 Other Types of E-Documents

In addition to electronic books (e-books), print-on-demand (POD), e-zine or email publishing, a number of different e-publishing models are in picture at present. More types of e-publishing are sure to be developed in the near future. However, two of them are more important and mentioned here.

- i) **Digital Content:** Digital Content generally refers to the electronic delivery of fiction which is shorter than book-length, nonfiction, documents and other written works of shorter length. Publishers of digital content deliver shorter sized works to the consumer via download to handheld and other wireless devices. Technology used for delivering digital content includes PDF, XML, HDML, WAP (Wireless Application Protocol) and other technologies. The security of the data being delivered is the major concern of publishers who want to ensure that they can deliver digital content without the risk of someone copying the work and selling or giving away the works. The market for wireless content, which is being developed to deliver content to everything from phones, handhelds, microwaves and even clothes, is a potentially enormous market. This fact has the major media companies and publishers scrambling not to be left out of the digital content arena.
- ii) **Electronic Ink:** Electronic Ink is a developing technology that could have a huge impact on the media and publishing industries. Electronic Ink could be used to create a newspaper or book that updates itself. The technology could also be used on billboards, clothing, walls and homes to allow content to appear. In addition, this content could be programmed to change at any time. For example, you could have a billboard that rotates different ads, or you could receive a coupon in the mail that is frequently updated with the latest offer. For media companies, the possibilities are almost endless. Some day your electronic newspaper will simply update itself every day. E Ink Corporation, a new company with major investors, and Xerox are two companies currently developing this technology.

Self Check Exercise

18) Write a brief note of Electronic ink.

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

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

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10.8 PRICING OF E-DOCUMENTS

As we have learnt already that e-books are electronic versions of books which are delivered to consumers in digital formats. There are a large number of devices being developed to make reading e-books easier for consumers. Special software, which makes documents or pages of a book easier to read on a screen, is also being developed by software companies. A standard for e-book software, known as the open e-book (OEB) standard, has been developed as a standard format for e-books, but other standards like PDF do also exist. The potential market for e-books (and shorter length content) is extremely large. Although presently there is some sales resistance to the idea of abandoning paper books for a handheld electronic reader, certain sectors of the buying public are already recognizing the benefits of e-books over paper books. People seem thrilled with the idea of downloading more than one book into a small, portable reader. E-books are already starting to be trendy. The market of e-books could develop faster than imagination because leading publishers and technology companies are pouring money resources into e-book technology. It remains to be seen, however, exactly which electronic devices and which software will succeed and exactly how long it will take people to convert to e-books.

- a) **E-books Pricing:** Though there are different factors to decide the cost of e-documents, e-books pricing and access models still going through a trial period, pricing of such documents specially e-books are considered on the basis of the following:
- i) Print-on-demand;
 - ii) Monthly subscription fees;
 - iii) Free browsing of content with fees for downloading and printing;
 - iv) One-time purchase of content with perpetual access or annual access fees;
 - v) Subscription fees with or without ownership;
 - vi) Some e-book providers work only with libraries and other market to individual end users;
 - vii) copy cost with single user access for a specified amount of time.

Some publishers of e-books are having their individual formula of pricing e.g., net library charges one-time fee of 155% of print; Safari Books Online offers access to hundreds of

leading technology books from Addison Wesley Professional, Cisco Press, O'Reilly, Peachpit Press, Prentice-Hall, etc. and uses a point system with multiple user access; Ebrary offers unlimited access based on an annual fee, but will charge for copying and printing portions of content.

- b) **E-journal Pricing:** One of the major issues that the publishers are concerned with is to save their economic interest in the process of providing electronic access to their printed publications. The publishers make a significant investment in the process of production of a journal, which involves activities like peer-review, administration, editing, layout design, production, subscription management and distribution, etc. Most of the activities that are performed for publishing a journal are common to both electronic and paper media. Some people feel that the cost of electronic journals could not be substantially lower than their printed versions. Journals are made available through the web at varying price models. Normally the full text access models are categorized as Publisher Portal; Aggregator; Open Access & Mixed models. Some of the prevalent pricing models are:
- i) **Subscribe One Get Two:** The electronic subscription to journals in most of the cases is linked to their printed counterparts, i.e., the electronic version is offered free with print subscription or priced at a fixed % over the print subscriptions.
 - ii) **Campus Licensing:** Electronic publisher facilitate campus wide unlimited access to subscribed journals on payment of a fixed amount of platform fee. For example: Elsevier Sciences (ScienceDirect).
 - iii) **Bundled Subscriptions:** Several electronic publishers offer access to the entire range of their electronic journals and other publications bundled into one. For example IEEE/IEE Electronic Library (IEL) and ACM Digital Library offer access to their entire site on subscription. Subscription to individual journals or a subset is not permissible. Similarly, Academic Press offers all journals available on their site (Academic's Project IDEAL) for 10% more than the print subscription to library consortia.
 - iv) **Pay-per-Look:** Publishers and aggregators have started experimenting with models wherein a user can search a database online for a modest usage fee, identify articles of interest, and then call up such articles in full-text on a per-look basis.
 - v) **Electronic Only:** A few publishers and aggregators have started offering only electronic version of their journals providing a modest discount for those who forego print version.
 - vi) **Consortium Licensing :** Consortia provide union strength to negotiate with electronic publishers for the best possible price and rights. Most publishers already have well-defined policies and offers for libraries subscribing as consortia. The consortia licensing is widely used the world over by the libraries. It is slowly picking up in India also. One classic example in India is INDEST (Indian National Digital Library in Science and Technology) Consortia, covering all IITs, IIMs, NITs and RECS.
 - vii) **National Licensing :** National licenses can also be negotiated with electronic publishers for core collections. Singapore, Taiwan and UK have arranged national licenses for some of the important full-text resources.

10.9 CURRENT ISSUES IN E-PUBLISHING

10.9.1 Commissioning and Peer Review

Commercial publishers have long been responsible for commissioning work which they believe to be of publishable quality. They believe that these will meet consumer expectations. In most cases the reader can rely on the publisher to provide books that are

(for the most part) well written and have some merit. The Internet has, however, provided authors with a place in which to cheaply publish their work, allowing many authors that would ordinarily not have been offered a publishing contract to self-publish their work. But users may not be interested to go for rather unknown authors. Although hesitant to invest heavily in unknown authors and e-books to date, it seems that some major publishing houses are beginning to turn to self-published e-book authors for new talent. Once an author has self-published and has a proven history of e-book sales, publishers are almost guaranteed sales of the printed book because the author already has an established fan base. Authority, validity and quality of writing are also key concerns in the field of scholarly e-publishing, particularly in areas such as medical publishing where incorrect data may lead to potentially dangerous misinformation. Peer review has traditionally helped academic publishers filter out work containing poor-quality and inaccurate data.

10.9.2 Editing and Proofreading

Many traditional editorial and proofreading functions are now automated due to emergence of desktop publishing (DTP) packages. Incorporation of multimedia into many texts, book design, typesetting and other analogous works are done easily in-house. These have changed the editor's work and responsibilities. In terms of the author-editor relationship, email now allows swift, direct communication and exchange of digital, print-ready files, regardless of authors' geographical location. This drastically reduces the amount of time that books and journals spend in production, and means that publishers can more easily publish the work of authors that are based in remote locations. This is also often the case for editors, with many choosing to work on a freelance basis, from home. One negative aspect of the surge in self-publishing is the decrease in standards of editing and proofreading.

10.9.3 Design and Typesetting

The role of the designer and typesetter is changed due to the intervention of DTP. Self-publishing programs are now readily available and easy to use, thus automating many of the tasks that could only have been previously performed by skilled designers or typesetters. The auto pagination, 'copy and paste' and 'search and replace' functions, 'live' tables of contents and indexes, cross referencing, spell checking, etc. enable authors to prepare and post their work online in an acceptable format. For both self-published authors and publishers, current e-book text design seems to mimic the text design of traditional, printed book. This may change in the future, as designers and publishers continue to expand the limits of e-publishing and, possibly, as readers begin to demand more functionality from their e-text.

For publishers, electronic delivery also has impacted on sourcing and delivery of graphics. Images and figures must be of a high density (300 dpi at least) in order to print at a reasonable quality, whereas graphics that are destined for publication need only be set at low density to achieve an acceptable quality. This allows publishers to avoid using reprographic houses or designers, which has a significant effect on the amount of time and money required to produce a publication. In addition, images are easily sourced online and email enables instant delivery of text and graphics files.

10.9.4 Printing

One major financial benefit that publishers stand to gain from e-publishing is the removal of printing from the publishing process. Traditional printing had been a highly cost involvement process for publishers. Poorly printed text or printed errors can lead to entire print runs being 'pulped' and can be extremely costly in terms of both time and money. In contrast, an error in a printed website is easily fixed and the absence of 'pages' removes the concern for pagination and imposition of text. This also means that an amendment to one part of the text does not affect the layout of all other text, as it does in printed books. Aside from CD-ROMs, there are currently two main ways to read hypertext: (i) on a

desktop computer; and (ii) using a handheld PDA. Most scholarly and reference publishers have designed their content to be read on the home or office computer, because users most often seek scholarly or reference information while in the office. It should be noted, however, that readability and eyesight strain can be an issue on standard PCs, and heavy traffic on the Web may disturb in getting access.

In an attempt to accommodate the preferences of both styles of user, many academic publishers offer ‘live’ (hyperlinked) and ‘flat’ PDF versions of manuscripts, the latter enabling users to print a version of the article that closely resembles the style and layout of a printed journal article.

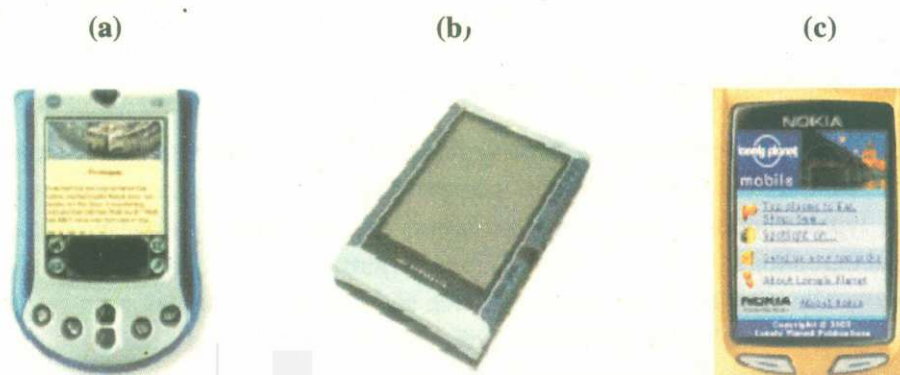


Fig. 10.1: a) Palm Digital's e-Reader, (b) Microsoft's Reader and (c) Lonely Planet's mobile phone interface.²

Commercial e-books are most often designed to be read on portable, hand held PDAs such as Microsoft's Reader and Palm Digital Media's e-Reader. Lonely Planet is one reference publisher that now markets its electronic content specifically to be read on PDA devices. These are a few examples of e-document reader.

10.9.5 Sales and Marketing

Now-a-days, publishers have realized a lucrative way to use the Internet for profit, without investing heavily in e-publishing. Direct online book sales allow publishers to sell books directly to the customer bypassing the bookstore, and books are rarely published today without a URL on the cover, directing the reader to visit the publisher's website. In turn, this allows publishers to recoup a larger profit margin because they are able to avoid paying excess to book stores.

Now major trade publishers have begun to realize the extent to which websites can act as marketing and publicity tools to sell books and have begun hosting authors' web pages on their sites. The publicity department of the publisher is catered for by the provision of biographies, pre-print excerpts and images online: all the elements that would once have been distributed to journalists and reviewers as a media kit are now available on the website. Direct contact details are also given for relevant marketing and publicity coordinators and literary agents. Although readers seem not to have embraced the Internet as a medium on which to read fiction, many have welcomed the opportunity to use the Internet as a place to discuss books and ideas. Online forums and book clubs have helped to cultivate an online literary culture, in which people are free to discuss about books with others – often in other countries. Many online book clubs are economically feasible because they use the Internet to sell books. In this sense, cultivating online forums and book clubs is a way of bringing customers to the e-book store, capturing their attention, and ensuring that they return to the site. A few publishers publish notes for reading groups on their websites. This is as a move by publishers towards using their websites as knowledge portals, rather than as catalogues. The largest, and by far most well-known, online bookseller is Amazon.com <<http://www.amazon.com>>.

² By courtesy: Wyatt, Deborah, Senior Editor Blackwell Publishing and Australian Journal of Emerging Technologies and Society.

10.9.6 Warehousing and Distribution

As mentioned above, sales of books through the Internet allow the publisher to deal directly with the reader. This not only increases profit, but it also means that publishers no longer have to deal with the warehousing and transport costs associated with 'returns' from booksellers who have been unable to sell their allocated quantity of stock. All stock can be centrally stored, thus allowing a consolidation of warehousing costs. Even better, electronic content removes the need for warehousing altogether, and allows distribution to customers 'at the click' of mouse button.

Self Check Exercise

19) What are the different methods of pricing e-journals?

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

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

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10.10 NETWORK PUBLISHING

Network publishing is an emerging paradigm that addresses the challenges that publishers face. It will help publishers realize the benefits of the new information economy and improve methods to leverage digital content using the Internet. The latest and the most widely used electronic media for storing, exchange and distribution of information in electronic form is the Internet and its related services like World Wide Web.

As society becomes more information-intensive and digital content becomes more synonymous with information, network publishing will play a key role in transforming our lives. It is not an overstatement to say that network publishing will allow businesses to create more shareholder value, enable governments to govern more effectively, enable educational institutions to spread their reach beyond their physical boundaries, and allow not-for-profit organizations to be more cost-effective in achieving their goals. Network publishing will allow consumers to take more control over their lives, be more connected with their social networks, and use their time more efficiently.

The networking publishing involves many other concepts as shown below:

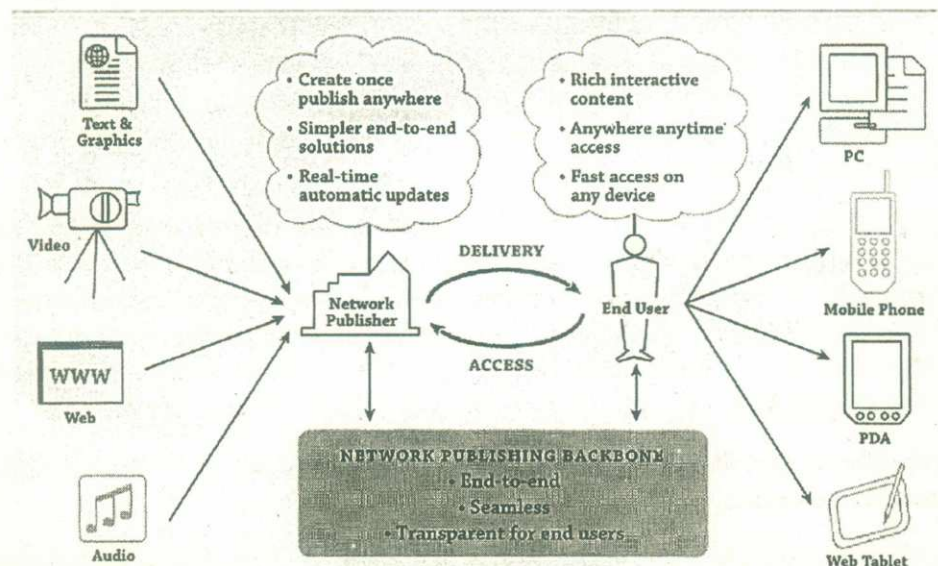


Fig. 10.2: A Sketch on Network Publishing³

³By courtesy www.atkearney.com

Network publishing is an emerging set of processes and technologies that people will use to create, manage, and access digital content over the Internet. In this future vision, publishers will be able to:

- create digital content once and publish it anytime, anywhere, on any device;
- integrate multiple digital content workflows together for greater efficiency;
- use simpler, integrated end-to-end technology solutions;
- easily assemble and syndicate content from multiple sources; and
- enable real-time updating of information to keep it current, accurate, and reliable.

Such efficiency and flexibility result in lower costs, higher customer satisfaction, and new revenue streams for businesses. End users will be able to:

- access rich, interactive content and enjoy high-quality viewing and listening experiences;
- access content anytime, anywhere, on any device ;
- pay easily for what they value and ignore what they do not.

10.10.1 Network Publishing Technology

Network publishing or Internet publishing, i.e., publishing through network, is a form of electronic publishing. Publishing materials on the Internet usually occurs through Websites, FTP sites, or distribution of files or articles to mailing lists or news groups. A distinction is usually made between the creation of material for public consumption and participating in online discussion. The former type of electronic publication provides no direct means of criticism or comment, whereas discussion groups and mailing lists facilitate the free exchange of information through direct communication (follow ups to messages posted to the forum). World Wide Web (WWW), popularly known as w3 or simply 'The web' is the most widely used navigational tool on the Internet, which helps the users to access hundreds of sites all over the globe without even knowing their addresses or locations. Nearly every company in the World has some type of website, and most media companies provide a large number of web-based content. The documents are stored in files in these sites and are known as web pages or homepages. The hypermedia web pages are created by institutions, organizations, business establishments or even individuals and are stored in the local computer systems to be accessed by the potential users via Internet. So publishing over net continues to change and develop with the introduction of new programming languages. HTML is still the most widely used web programming language, but XML is also making headway. XML is valuable because it allows publishers to create content and data that is portable to other devices. The SGML family of standards, especially XML and its derivatives, is used to dominate the ecosystem of network publishing. Some of the key standards that will play an important role in this ecosystem to ensure that digital content is leveraged more effectively are:

- *XML (Extensible Markup Language)*: A meta language derived from SGML for structuring and transmitting content including text, graphics, and other types of digital content. XML and its family of standards can be used by many applications to create and manipulate digital content and to support data interchange and application integration. The proliferation and standardization of XML-based products and services will enable fully interoperable and compatible network publishing solution.
- *XSL (Extensible Style Sheet Language)*: Provides instructions for formatting XML data and documents.
- *SVG (Scalable Vector Graphics)*: A standard based on XML that addresses the problem of sharing many sophisticated images, enabling more rapid graphical information transfer by using plain text representation technology.

- **SMIL (Synchronized Multimedia Integration Language):** An XML-based standard that provides an author with the ability to describe the temporal behavior of an online multimedia presentation.
- **PDF (Portable Document Format):** Allows for accurate and graphically rich layouts to be shared efficiently. Adobe's Acrobat Distiller and Reader are used for this purpose.

In addition to standards, parsers (tools that are standalone or part of a client application that interprets specific instructions) are required to check for form integrity and validity of the document type definitions. Some of the parsers that will emerge in this ecosystem are Java, which will be available for multiple types of clients, and WAP, specifically for wireless devices.

10.10.2 Network Publishing Technology Providers

Network publishing product and service providers consist of four major categories – Value Added Service Providers, Software, Device and Infrastructure.

a) *Value Added Service Providers*

This category offers a complete set of technology services around the software, hardware, and infrastructure components of network publishing solutions that are customized and tailored to the needs of network publishers and end users. This category includes (i) System integrators that provide services for solution design, implementation, and ongoing systems management; (ii) Application service providers, which provide services for managing Websites, mobile applications, and delivery; (iii) Industry/functional service providers, that offers services for digital imaging and printing services.

As the outsourcing of non-core activities and functions for companies becomes more important, the value-added service providers will play a critical role in the network publishing ecosystem. The application service provider and industry/ functional service provider categories are still emerging, compared to the system integrators category. Due to the relative immaturity of the category, many of the application and industry/function services categories currently provide a subset of the end-to-end network publishing solutions. As these categories grow and become more accepted, there will be an increase in new types of network publishing services.

b) *Software Vendors*

Software vendors are a critical category of network publishing providers because they provide the technology functionality necessary to process digital content. They can be segmented into three major categories – creation, management, and access.

- i) The creation category includes applications for creating digital content in all media types and digitizing legacy content that can then be delivered through multiple channels. This category includes:
 - *Authoring tools:* Adobe's Illustrator and Photoshop for high-quality graphics; Microsoft Word for word processing; Avid's Pro Music for creating and editing audio; and Pinnacle Systems Alladin Pro for structuring, editing, and enhancing video.
 - *Conversion applications:* HP's scanning utility software for converting one media type into another media type .
 - *Structuring tools:* Adobe's Frame Maker, which creates overall layout, tags and links relevant pieces of content .
 - *Aggregation tools:* Adobe's GoLive and Macromedia's Director that offer basic functionality for combining content from various media .
 - *Scripting utilities:* Allaire's (Macromedia) Coldfusion and IBM WebSphere that allow more contextual and interactive content to be developed.

- ii) Content management software makers provide the tools that are primarily server based and offer a framework for integrating and automating all the key processes around digital content creation, aggregation, personalization, and delivery of content through multiple channels. This category includes:
- *Dynamic content production tools* for server/system generated content, such as Macromedia's Generator or TrueSpectra's Image Server .
 - *Content/asset management solutions* that provide workflow and tagging mechanisms to manage content more effectively, such as Interwoven's TeamSite or Vignette's Content Management Server. This category also includes functionality to manage/customize content for global reach, as provided by Idiom and Global Sight .
 - *Digital Rights Management solutions*, such as InterTrust's Commerce DRM platform or Content Guard's Rights management suite, that enable protection and copyrighting content.
 - *translation software solutions* from InfoSpace or AvantGo that can covert content meant for a particular channel for another device or channel.
 - *Personalization software solutions*, from ePiphany or Blue Martini, that provide the ability to customize and personalize content for a particular individual or group.
 - *Caching software solutions* from providers such as Akamai and Inktomi for optimizing digital content delivery through the Internet .
 - *Delivery software from providers* like AlterEgo Networks, BEA Software and RealNetworks that develop application server tools to present digital content for multiple channels and devices for all types of media.
- iii) Access software provider products include tools that reside on devices to access digital content. They fall into two major sub-categories:
- Viewer software includes tools such as browsers and players for viewing content. This sub-category includes products such as Microsoft's Internet Explorer, Adobe's Acrobat and eBook reader, and RealNetworks' media player.
 - Authentication tools include software to ensure that digital content is securely delivered to the appropriate device or end user and include products from Verisign and Entrust.

The software category is made up of many point solutions. The overall trend is towards greater integration and larger and more complete software applications.

However, some categories will be positioned to generate more value than others in the next two to three years. Overall, content management tools are likely to be high-value generators in the software provider category.

c) ***Device Manufacturers***

Device manufacturers provide the hardware appliances that enable publishers to create and access digital content. These devices are linked to the Internet through wireless or wire line infrastructure. Key categories of device makers include:

- *Workstation manufacturers* such as, Dell and Sun that manufactures personal computers and workstations to help users create digital content.
- *Digital imaging and multifunctional device (MFD) makers* , such as Sony which makes digital cameras, and HP and Canon which manufactures integrated fax, printer and digital scanners.

- *Entertainment device maker* such as Sony, Liberate and Saga that creates devices like televisions, interactive TV Set Top Boxes and gaming consoles respectively.
- *Mobile device makers*, such as Nokia for wireless phones and Palm for PDAs and manufacture of eBook readers, such as NuvoMedia and Franklin.
- *Printer manufacturers*, such as HP and Canon that make inkjet and laser printers, etc.

Devices are important to network publishing because they provide the gateway for publishers to create content and for end users to access content. Key trends in this sector include an increase in the proliferation of mobile devices, an increasing ability to share content directly across devices (e.g., printing from a cell phone or digital camera), and greater functionality of devices.

d) *Infrastructure Providers*

The infrastructure provider category includes the hardware, software, and services that form the backbone for network publishing:

- *Middleware* provides the software and services that form the underlying glue for multiple systems to communicate more effectively. Some of the key segments in this category include enterprise application.
- *Infrastructure service providers* offer the underlying services that are necessary for network publishing. Key service areas include data center facilities, storage services, Internet access and hosting services.
- *Infrastructure hardware providers* design and manufacture the hardware required for network publishing. Some of the key products include servers from vendors like HP, Dell and Sun; storage systems from HP, EMC, Hitachi; and networking equipment from Cisco and Nokia.

Infrastructure provides the platform for network publishing. As digital content becomes more complex, dense, and increasingly includes multimedia, there is a growing importance of increased bandwidth and lower latency. As the Internet evolves, the infrastructure is being extended, refined and optimized to handle more complex digital content. As this enhancement is realized, new computing models (e.g., peer-to-peer) will begin to emerge.

10.11 FUTURE TREND OF E-PUBLISHING AND NETWORK PUBLISHING

Despite its boom and bust swing, electronic publishing is still an industry in its infancy – in the toddler stage, and also an industry that is undergoing rapid change. Technological advances are continually reshaping the industry. Consequently, it is extremely difficult to predict what will happen next or how the industry may change in the next few years. Many commercial e-publishers are taking active steps to influence these changes and to improve the reputation and acceptance of e-books. E-publishers and authors consider consumer education and industry education to be a major part of their mission. Most are certain that consumer and industry acceptance of e-books may continue to grow.

One thing is clear that it is a choice to be made carefully, after serious consideration of the potential advantages and disadvantages. It is not a venue to rush into out of desperation or excessive haste to be published. Opportunities for online publication should be assessed not on the basis of ego, desperation, or the ease with which such publication can be accomplished, but on a serious evaluation of the pros and cons.

Network publishing will lead to the creation of new business models. Examples include: (i) Content dis-aggregation that will allow end users to buy a chapter from a book or a single song from an album; (ii) Content syndication by which a new class of aggregators will provide content search and aggregation services for a fee to knowledge

workers; (iii) Super-distribution that will enable end users to exchange copyrighted digital content through mobile devices while simultaneously ensuring payment to copyright owners; and (iv) A more efficient market for consumer information wherein consumers will be able to charge a fair price in return for sharing information about their buying preferences and habits (or pay a premium for securing their personal information).

These new products and services will make the process of creating and managing content easier and more efficient for publishers. End users will benefit from the ability to access any kind of content from an array of devices. Companies that learn how to leverage knowledge over the Internet using digital content will thrive on the basis of new business models; those who do not learn the digital content game will lag behind.

The new products, services, and business models will also impact our world on a global basis. Boundaries between people will decrease as communication and collaboration become easier and more efficient. Consumers will be able to access real-time content from any location around the globe and have it delivered in a personalized fashion that takes into account cultural differences such as language. Moreover, the real-time nature of content will increase human productivity and provide us with more time for ourselves.

Market efficiency should dramatically improve as visibility into worldwide events occurs in real time. Those with real-time access to content will be able to make quicker decisions, especially in the commercial realm. In addition, the growth of digital content and its increasing importance to collaboration and commerce will make the world more knowledge-oriented. Hence, network publishing will dramatically influence how we interact with each other, how we make decisions, and how we organize our lives.

Self Check Exercise

20) What is network publishing?

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

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

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10.12 SUMMARY

E-publishing is a form of publishing in which documents are produced and stored electronically rather than in its traditional print form. E-documents may be produced in a variety of storage device including CD-ROM disk, or online, or as a file that can be downloaded or transmitted via e-mail, or as a file that can be downloaded to a hand-held electronic reader or similar device. Many e-publishers offer documents in several of these formats. E-publishers produce and distribute new works, which appearing for the first time, may only appear in the electronic format i.e., basically in-born electronic. Thus in true sense, e-publishing does not include the following types of e-documents production. (i) Providing electronic text versions of previously published works (such as classic literature, non-copyrighted material, or works that have entered the public domain, either online or on CD-ROM. (2) Offering an electronic version of a document that is simultaneously being produced in print (e:g., by making an edition available for a hand-

held e-reader). In this case, the book would be considered a print publication, and the electronic edition would be considered a subsidiary form of publication.

Publishers traditionally draw on a number of services and skills to create books and journals, including: (i) commissioning and (in the case of academic texts) peer review; (ii) editing and proofreading; (iii) design and typesetting; (iv) printing; (v) sales and marketing; and (vi) warehousing and distribution. The aim of the present Unit is to analyse the impact that e-publishing technology has already had on each of these areas and the extent to which traditional approaches to publishing may change in the future. This includes an overview of hypertext – both fictional and non-fictional – and a broad historical analysis of the reaction that publishers and booksellers have had to e-publishing to date. Drawing on this overview, the main section of this review consists of a ‘tour’ through the publishing process, balancing the merits and pitfalls of e-publishing’s effect on each of the aforementioned stages.

Network publishing participants have an opportunity to reap the substantial benefits of this exciting new market. Although the exact timing and specific evolutionary path of network publishing will only become clearer over time, certain broad imperatives are already becoming obvious for network publishers and providers.

Network publishers should identify where they can more effectively leverage digital content using the Internet. For universities, it could be their vast intellectual capital; for a consumer goods company, it could be information on consumer preferences; and for a complex machinery manufacturer, it could be a knowledge base about machine operations and troubleshooting. In addition, publishers should determine the potential opportunity to create a competitive advantage or improve the top or bottom line by leveraging knowledge. Finally, they must work with network publishing providers to develop and implement digital content solutions that provide clear and compelling economic benefits.

Providers of network publishing products and services should identify what roles they want to play in the network publishing ecosystem. There are three basic choices – create a niche product or service, dominate a category, or aggressively develop/acquire new capabilities to create end-to-end solutions across categories. Moreover, providers should begin working with publishers to develop and implement network publishing solutions. Anchor customers that successfully demonstrate the economic benefits of network publishing solutions will act as proof points and success stories to drive more rapid adoption in other publishing segments. Realizing the vision of network publishing will require significant resources and efforts from ecosystem participants, but the economic benefits for all parties will justify their investments.

10.13 ANSWERS TO SELF CHECK EXERCISES

- 1) Johannes Gutenberg invented the printing press with of movable type in 1455. The first book produced by Gutenberg’s printing press is the ‘Gutenberg 42-line Bible’.
- 2) The generic term ‘Electronic publishing’ or ‘e-publishing’ is used to define the production of any non-print media document that is published in digitized form. It uses new technology allowing publishers to get information to readers to deliver documents and other content quickly and efficiently as well. E-publishing is helpful in producing documents containing text, graphics, still or motion pictures, audio, video, tables, numeric, equations, or a combination of any or all of these with the assistance at a data processing system. Unlike traditional publishing, where the audience must be quite sizeable for the enterprise to be worthwhile, electronic publishing can enable any individual member to select exactly what he or she wants – potentially it is possible to appeal to an audience of one! At present the World-Wide-Web provides the most visible and fast-expanding environment for these activities. Electronic presentation opens up many new possibilities for improving and extending access to information, but those involved in the publishing industry need a good mix of skills to use it effectively.

- 3) In 1979, Doug Adams released the popular science fiction novel, '*The Hitchhiker's Guide to the Galaxy*', in which protagonist Ford Perfect researched the galaxy for a vast electronic book called *The Hitchhiker's Guide*. The *Random House Electronic Thesaurus* is arguably the world's first commercially available 'Electronic Book' (e-Book) which was published in 1981. This is another landmark for today's e-publishing.
- 4) The concept of 'e-publishing' covers a variety of publishing models and formats. E-publishing models include commercial e-publishing, subsidy e-publishing, no fee distributors, and self e-publishing.
- 5) Trade publishing is otherwise known as Commercial publishing. Commercial e-publishers typically sell their books through their own Website, as well as through Amazon.com, Barnes and Noble, and other electronic bookstores. Some produce editions for hand-held e-readers and other handheld formats (such as the Palm). Some are also available through Barnes and Noble's real-world outlet, in the form of Rocket Editions (downloadable for the Rocket Book e-reader). Some offer both electronic downloads and disks or CD-ROMs, and some also offer print-on-demand services. Most provide such service as obtaining ISBN numbers, copyright registration, and sometimes also a LC (Library of Congress) listing. While it is generally possible to order a commercially published e-book by ISBN through a bookstore, most bookstores do not actually carry them on the shelves. Distribution in traditional bookstores, however, is still limited.
- 6) Vanity publishing is sometimes called subsidy publishing since the author pays a subsidy to get a book published. Subsidy e-publishers, like their print counterparts, produce and distribute books for a certain fee per manuscript. Authors receive a royalty, which is usually comparable to that offered by commercial e-publishers (around forty percent). Generally manuscripts are not edited or proofread, but published as it is. Many subsidy publishers have a range of extra charges – such as charges for formatting the book if the author has not done so, charges for illustrations, for cover designs, for editing, for an ISBN or copyright registration, etc.
- 7) Electronic Self-publishing is a process in which the author is entirely responsible for producing his/her own book, from development to publication to marketing. Many authors choose to electronically self-publish their manuscript. In self-publishing, the author formats the text (or arranges for formatting), and is responsible for obtaining the ISBN and copyright registration. This offers an excellent, inexpensive alternative to print. self-publishing – for the obvious reason that one does not incur the huge cost of getting one's book printed.
- 8) The full name of POD is Print on demand. The term is self explanatory. On-demand publishing allows publishers to print commercially competitive books a single copy at a time, a true revolution in the basic publishing model. This is considered as a form of electronic (or digital) publishing in which a book is submitted to the publisher electronically, and is stored as an electronic file, to be printed out in book format only when it is actually ordered by the customer. POD publishing is getting popularity in case of self-publishing. Anybody who prints a bunch of pages using their computer and printer, punches holes in the margin and arranges them in a spiral-ring binder, can perfectly claimed themselves as self-publisher. But as far as the industry is concerned, a publisher, whether a person or business company, should have purchased at least one ISBN (International Standard Book Number) block.
- 9) POD publishing offers different advantages to authors.
 - i) *Low Cost* : This form of e-publishing avoids the massive up-front cost of printing several thousand copies. So such publishing is less costly. However, production of a considerable number of copies would be cost effective.
 - ii) *Easy Production* : Print-on-demand is also a good alternative for someone who basically wishes to self-publish, but wishes to avoid the costs associated with producing a printed book.

- iii) *Reviving Out-of-print Book* : Many authors have also found that POD is an excellent way to revive out-of-print books. It is worth noting, however, that these titles and authors generally have a proven track record of sales, and quite often an existing readership.
- 10) Electronic information is stored in e-documents or media. Just like the print media are meant for hard copies of usual books, journals; a special type of media i.e., the electronic media are used in e-publishing. Basically possible computer storage media are mostly used for the purpose.
- 11) Electronic books are well known as e-books. E-books are electronic version of books, delivered to readers in digital formats. They are read on all types of computers, including hand held devices designed specifically for reading e-books. Hence an electronic book should have electronic text and that text is to be represented to the reader visually. The electronic text is either saved to a floppy disk, transferred onto a CD-ROM, downloaded from the Internet or built into a palm-sized digital reader. There are a large number of devices being developed to make reading e-books easier for consumers. E-books can be as familiar as their print counterparts or as unique as the electronic medium itself, containing audio, video or live hyperlinks.
- 12) E-books come in a variety of different forms. For instance, certain e-books are read on handheld devices like the Rocket Book Reader <<http://www.rocketbook.com>>. Mega bookstore BarnesandNoble.com sells e-book titles in this category. This software can be downloaded directly from the Internet onto the customers computer. The customer then has the option of reading the e-book on screen, or printing it out. The following file formats are used for e-books:
 - .DOC files
 - .HTML files.
 - .OeB (the Open eBook Standard format).
 - .PDF files.
 - .RTF files.
 - .TXT files.
 - .WPD files.
- 13) Electronic journal, e-journals in short, is a serial, produced, published and distributed in electronic media. Basically e-journal is one which is available in electronic form and can be accessed using computer and communication technologies. Often e-journals are called virtual journals, paperless journals, online journals, etc.

Three types of electronic journals are available: i) online journals which are basically the online versions of the print journals; ii) CD-ROM journals which are full text journals published and distributed on CD-ROM media periodically and iii) networked electronic journals published and distributed via the Internet.
- 14) The networked e-journals can be distributed by the following ways:
 - i) *Contents page and abstracts;*
 - ii) *Full text delivery;*
 - iii) *Client/server technology.*
- 15) Of all types, network e-journals are most popular and easily accessible. They are used almost synonymously to e-journals. Now-a-days, an e-journal is referred to generally as a networked e-journal. There are three access models to e-journals
 - a) *Remote Access:* Publishers host their journals at their website. Access Permission is provided, when the library or individual subscribes to the e-journals. Publishers offer the rights through one of the following methods:

- i) *User ID and Password*: The subscriber gets a user id and password, which can be used from any user terminal in the library. This is suitable for dial up access users.
 - ii) *IP enabled (intranet)* : This method can be used by the libraries who have intranet based LAN in their libraries or campus. Here publisher's server site will recognize and validate the IP address of subscriber's intranet server when each time a user logs into publisher's website for a subscribed journal.
 - iii) *Combined*: Both of the aforesaid access methods are also offered by the publishers.
- b) *On Site Access*: Publishers deliver the e-journals to subscribers through CD-ROM or through their website or FTP option. This is more suitable than above methods because it is more secure to maintain the journal at its end as it has paid for the journal (the library) and is used to the ownership concept. As library can host the journal within its campus through LAN it offers wider and better bandwidth for access than access through Internet.
- c) *Access through Database*: The access and use of information in an electronic/digital format is not a new concept. Some publishers have been producing their content in an electronic format for years. Access models offered by publishers limit the access to their journals, but the users often find articles of their interest through database.
- 16) An e-zine, also known as an email magazine, online publication or electronic newsletter/magazine is simply a newsletter, stored on a file server, distributed or accessed via email and/or online. It is also called Web-zine. There are thousands of e-zines on various subjects available on the Internet free of charge. Some of them are www.indiatoday.com, www.musicindia.com, www.bestindiansites.com, www.news.sify.com etc.
- 17) An ETD (Electronic Thesis and Dissertation) is a document that is prepared as a result of research work carried out by student of post-graduate course or research degree. It is presented in a form simultaneously suitable for machine archives and worldwide retrieval. ETD is prepared using nearly any word processor or document preparation system, incorporating relative multimedia objects. Consequently ETDs are less expensive to prepare, consume virtually no library shelf space, and never collect dust. At users' choice, they can be available to anyone that can browse the World Wide Web. There are many websites for ETDs, the following are a few to name:
- <http://www.theses.org>
 - <http://www.vidyanidhi.org.in>
 - <http://ohiolink.edu/etd>
 - <http://etd.iisc.ernet.in>
 - <http://www.unesco.org/webworld.etd/contribution.html>
 - <http://scholar.lib.vt.edu/thesis>
 - <http://www.moe.edu.sg>
- 18) Electronic Ink is a developing technology that could have a huge impact on the media and publishing industries. Electronic Ink could be used to create a newspaper or book that updates itself. The technology could also be used on billboards, clothing, walls and homes to allow content to appear. In addition, this content could be programmed to change at any time. For example, you could have a billboard that rotates different ads, or you could receive a coupon in the mail that is frequently updated with the latest offer. For media companies, the possibilities are almost endless. Someday your electronic newspaper will simply update itself every day. E Ink Corporation, a new company with major investors, and Xerox are two companies currently developing this technology.

19) The Pricing models are:

- i) *Subscribe One Get Two*: The electronic subscription to journals in most of the cases is linked to their printed counterparts, i.e., the electronic version is offered free with print subscription or priced at a fixed % over the print subscriptions.
- ii) *Campus Licensing*: Electronic publisher facilitate campus wide unlimited access to subscribed journals on payment of a fixed amount of platform fee. For example: Elsevier Sciences (ScienceDirect)
- iii) *Bundled Subscriptions*: Several electronic publishers offer access to the entire range of their electronic journals and other publications bundled into one. For example IEEE/IEE Electronic Library (IEL) and ACM Digital Library offer access to their entire site on subscription. Access to individual journals or a subset is not permissible. Similarly, Academic Press offers all journals available on their site (Academic's Project IDEAL) for 10% more than the print subscription to library consortia.
- iv) *Pay-per-Look*: Publishers and aggregators have started experimenting with models wherein a user can search a database online for a modest usage fee, identify articles of interest, and then call up such articles in full-text on a per-look basis.
- v) *Electronic Only*: A few publishers and aggregators have started offering only electronic version of their journals providing a modest discount for those who forego print version.
- vi) *Consortium Licensing*: Consortia provide union strength to negotiate with electronic publishers for the best possible price and rights. Most publishers already have well-defined policies and offers for libraries subscribing as consortia. The consortia licensing is widely used the world over by the libraries. It is slowly picking up in India also. One classic example in India is INDEST (Indian National Digital Library in Science and Technology) Consortia, covering all IITs, IIMs, NITs and RECS.
- vii) *National Licensing*: National licenses can also be negotiated with electronic publishers for core collections. Singapore, Taiwan and UK have arranged national licenses for some of the important full-text resources.

20) Network publishing is an emerging paradigm to leverage digital content using the Internet which is the most widely used electronic media for storing, exchange and distribution of information in electronic form. It provides facilities for exchange of ideas or information among individuals and organizations situated at far away places around the globe; access to documents, databases stored in computers at local and remote places; browsing of catalogues of libraries of far away places for selection of reading materials. It facilitates downloading and printing of information to the local computers from remote computers. Thus, it is a true media of availing the electronic information.

10.14 KEYWORDS

ASCII	: American Standard Code for Information Interchange.
e-	: Anything in electronic, or more exactly in digital form.
e-Article	: An eArticle is any material shorter than book-length which is distributed electronically.
e-Books	: In the broadest sense, any books published in digital form.

- e-distribution** : Electronic distribution refers to distribution of information, art, or software through the World Wide Web or FTP sites or, in some cases, through mailing lists.
- e-Editions** : A particularly powerful application of digital technology to replace printed critical editions of primary texts.
- e-Learning** : The use of digital resources for teaching and learning.
- e-Links** : Hyperlinks can greatly enhance the value of e-publications, providing a convenient and very powerful means of cross-referencing. There is an important e-Science agenda for using these to link the results of research with the related data: see below.
- e-Monographs** : Some presses are making printed monographs available for purchase or subscription in digital form. As a cheaper alternative for the publication of highly specialized research.
- e-Prints** : Digital equivalents of off-prints, pre-prints, or post-prints.
- e-Publication** : The term 'e-publications' usually stands for digital versions of conventional forms of publishing in print.
- e-Publisher** : An electronic publisher is the individual, business, or organization responsible for distributing the electronic form of information, art, or software being published electronically.
- e-Publishing** : Electronic publishing refers to the distribution of information, art, or software in any electronic form, usually on some type of physical medium such as CD-ROM, floppy disk, or magnetic tape, or across a computer network, such as the Internet or a publicly accessible dial-up bulletin board or online service.
- e-Science** : Broadly, any use of digital resources for scientific research. However the term is currently associated with a more specific agenda: the harnessing of distributed and disparate digital resources into unified virtual systems (<http://www.rcuk.ac.uk/escience>).
- e-Theses** : Electronic versions of doctoral theses. There are obvious arguments in favour of making these available (especially if publicly funded) in institutional or other Open Archives. There is however a risk that this might reduce the chances of theses being published commercially, as conventional books.
- FTP** : File Transfer Protocol.
- HTML** : Hyper Text Markup Language.
- Web-book** : A Web-book is any Website developed so as to publish a concise, discrete amount of information, art, or software which would – in printed form – meet the minimal criteria for being regarded as a book if printed in book form.
- SGML** : Standardized Generalized Markup Language.
- Webzine** : A Webzine is any Website constructed so as to publish a concise, discrete amount of information, art, or software on a regular or semi-regular basis, distinguishing between publications by issue and/or volume numbers. Irregular publication does not disqualify a site from being considered as a Webzine.
- XML** : Extensible Markup Language.

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UNIT 11 OVERVIEW OF REPROGRAPHY AND MICROGRAPHY

Structure

- 11.0 Objectives
- 11.1 Introduction
- 11.2 What is Reprography
 - 11.2.1 The Basis of Choice
- 11.3 Reprographic Methods
- 11.4 Photographic Process
 - 11.4.1 Camera Process
 - 11.4.2 Non-Camera Process
- 11.5 Non-Photographic Process
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 - 11.8.3 Types of Microforms
 - 11.8.4 Micrographics for Document Management
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 - 11.9.1 Selection of a Microform Retrieval System
 - 11.9.2 Roll Microfilm System
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- 11.10 Micrographics as an Interfacing Technology
 - 11.10.1 Computer Output Microfilm (COM)
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- 11.11 Micrographics—The Future
- 11.12 Summary
- 11.13 Answers to Self Check Exercises
- 11.14 Keywords
- 11.15 References and Further Reading

11.0 OBJECTIVES

In the previous Units you have learnt about various aspects of printing and publishing. In library environment we sometimes use micrographies and reprographies for different purposes. In this Unit we will be discussing the basic aspects of reprography and micrography.

In the previous Units you have learnt about various aspects of printing and publishing. In library environment we sometimes use micrographics and reprographics for different purposes. In this unit we will be discussing the basic aspects of reprography and micrography.

After reading this Unit you will be able to:

- know the meaning of the term 'Reprography' and Micrography';
- describe the criteria in choosing a reprographic equipment for the library;
- acquaint yourself with the different variety of reprographic methods;
- understand the implications of copyright to library reprographic service;
- trace the evolution of micrographics;
- analyse the applications of micrographics in library and information storage and retrieval;
- list the advantages of microfilm and its use in the library;
- describe the components of a micrographic system; and
- discuss the future growth of micrographics.

11.1 INTRODUCTION

Library is the storehouse of information. Major part of this information is made available in paper form. Information printed in paper medium is presented in various forms depending on end use, e.g., books, journals, monographs, reports, patents, specifications, etc. The magnitude of information generation and its proliferation into many forms have created problems of storage, processing and dissemination. Libraries have tried to overcome this problem by adopting modern techniques such as Reprography/Micrography, computerisation, CD-ROM, Telecommunication Network, etc. Libraries receiving enormous quantity of information (documents) have to process and organize this store in such a way that it becomes convenient for the reader to find the relevant document and supply the information on demand. In other words Libraries have to cater to need based information instantly. In order to achieve this goal the Librarian has to be familiar with the methods or techniques available which should be cost effective and efficient. This requires general understanding of the subject of Reprography and Micrography for better performance.

Reprography signifies reproduction of additional copy/copies. If a library wishes to extend its services beyond the four walls of its building, then it has to offer generous reprography service to its readers. The library also should announce to its readers what is new in the library towards better utilization of the library resources. In order to bring out periodical announcement in the form of lists/bibliographies, etc. also requires the use of reprography.

Today everyone is accustomed to taking photocopy (Xerox copy) of any reading material. However, it will be interesting to study the evolution and development of this useful technology. It will be also useful to understand the design and working of photocopying machines useful to libraries. We are excluding printing technology from our scope.

11.2 WHAT IS REPROGRAPHY

'Repro' means to rewrite or to reproduce and 'graphy' means printed or written matter. Therefore, reprography means reproduction of printed or written matter. Reprography

comprehends processes and methods used for both copy and duplicating (multicopies) of documents. Reprography is now internationally accepted term which replaces the earlier 'document copying' or 'documentary reproduction'. To sum up, Reprography includes microcopy (micrographics), photocopy, duplicating and in-house printing. It is in general characterized by the small scale of its operations and the non-professional nature of its operatives. In other words, Commercial Printing technology is excluded from its scope.

Modern reprography enables acceptable to high quality to be achieved at moderate cost particularly with normal quality originals. For many applications high standard of printing quality is not necessary. For example, an internal memoranda can be produced by stencil duplicating which is relatively cheap, fast and serves the purpose. The essence of reprography lies in speed and economy while quality of reproduction should be acceptable to the end user.

The librarian, in the highly technical world of reprography, often finds himself a uniformed layman. The same is true of data processing and sophisticated equipment generally. In order to remedy this situation, the librarian should get to know all aspects of reprography so that he could use his judgment in choosing the right reprographic method for a particular job and manage the reprographic facility. A librarian with a knowledge of reprography will be able to decide proper equipment choice and also maintenance of the equipment.

11.2.1 The Basis of Choice

There is a wide variety of reprographic equipment available in the market. Making the right choice is not easy. The uniformed librarian is at the mercy of the salesman. A salesman often exaggerates the advantages of the gleaming machine he has to sell and fails to mention the drawbacks, or at least soft-pedals them. The safeguard is for the customer – Librarian – to be knowledgeable enough to have a set of searching questions to ask.

Perhaps, a special word of caution is needed on bargain 'offers'. Of course, some are quite genuine, but many times refurbished or obsolete models are passed on to the customers. A demonstration of the equipment should be seen before any decision to purchase is made. Preferably a second demonstration of the machine may be arranged at the actual working place (Library), and the same machine should be tested on the kind of work it will do during its lifetime. This will expose the real capabilities of the machine. A machine may perform excellently in a show-room/exhibition demonstration because the machines are highly tuned and maintained beyond normal practicability (possibly by using better than usual materials, papers, etc.).

Running Cost (Cost per Copy)

A major factor in deciding a particular reprographic process or equipment would consider the running cost. In other words maximum should be gained for the least cost. The per copy cost should be the lowest possible. But per copy cost is often a snare and a delusion. Indeed they often require a costing expert to interpret them. However, cost per copy should not be in practice as an over-riding factor in the choice of process or equipment particularly so when other considerations like speed, quality, and convenience are more important. Figure for cost per copy are so often deceptive because the basis of costing is totally misunderstood. The simplest system confines itself to the cost of expendable materials (consumables). However, the costing becomes more complicated with the other relevant factors like machine amortization, electric power consumed, labour rates, overheads (space) and a proportion of administrative and managerial expenses of the reprographic service. Costing should also take into account the 'wastage'. For most purpose this over-concentration on cost per copy can be replaced by something less precise but more usable, namely a knowledge of approximate range, in terms of number of copies for which each process is economic.

Initial Costs

The cost of the equipment is important for cost comparison. It is axiomatic that highly expensive machines cannot be justified without high volume of workload.

If the workload does not justify buying a machine, the work should be done on contract basis from a commercial agency or the reprography service may be provided to users on a cost recovery basis with a marginal profit to enable the service to be self-supporting.

Quality of Copy

Quality of copy depends on the purpose to which the copy is taken. Many times high quality of copy, costing more, is not at all required for ordinary use. Here we may assume that sensible decisions are being made on the balance between cost, type of use and the standard expected for a particular job. Each reprographic process has its own capability to produce different quality rankings. For example Laser printer produced copies are better than letter quality printer produced copies.

Type of Original to be Copied

The choice of equipment should match the kind of job. The machine should be able to handle majority kinds of originals normally handled in a particular library. For example if the Library handles copying jobs from books and journals a machine which can handle originals upto A3 size will suffice the purpose. This machine cannot be used for taking copies from maps and drawings. The type of original also influences the reprographic process chosen for a particular job from the range of equipment available. For example, if the original has only text matter or line drawing, an ordinary xerographic process will do, whereas for copying half-tone originals requires photographic process for quality reproduction.

Speed and Convenience

Reprography unlike printing assumes short runs. That means number of copies reproduced in small numbers and the machine is not run all day. Therefore, copying speed is not very important. A speed of 1000 copies an hour is no significance if only 10 copies of document is required. More important is time taken by the machine to be ready to execute the job (warm up time). The time taken to change one original to another (Automatic document feeding) Speed and Convenience are therefore interrelated. They have to be carefully weighed at the time of choosing the reprographic equipment.

Skill in Use : Staffing

Though no formal training is necessary in operating a modern reprographic equipment, it would be wrong to say that no skills are required to operate and maintain reprographic equipment. The point being made is that formal training course and qualifications are rarely needed for running a reprographic facility. The requisite skills are largely picked up on the job, imparted by more senior staff, or in some cases a short training period is arranged by the manufacturer of the equipment. This means any staff member in the library can be trained to operate and maintain reprographic machine, however the responsibility should be given to a selected few and "not free for all". This will ensure minimum machine downtime and good care of the machine. In short, the policy of giving special responsibility to certain staff for reprographic equipment itself fosters in those concerned on attitude of 'Responsibility' and brings with it increased efficiency.

Permanence

The Older method of reprographic processes used to produce copies suitable for immediate use but over a period of time the copies tend to become faded or discolour. These processes are not suitable for producing permanent copies. For example hectographic duplicating produces copies which fades on exposure to strong sunlight. A photographic print will discolour if the residual chemical are not washed properly. Therefore, copies become

black if exposed to heat. So speed, convenience and permanence are closely related factors in choosing the right process and reprographic equipment.

Self Check Exercise

- 1) Mention the various factors which are necessary in choosing the right process and reprographic equipment.

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

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

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11.3 REPROGRAPHIC METHODS

Broadly, the various methods of reprography can be grouped under three major headings, according to the basic process principles involved :

- Photographic methods (Light sensitive)
- Thermographic methods (Heat sensitive)
- Electrostatic methods (Charge sensitive)

These basic principles are exploited to level on various methods and processes as follows:

‘Photocopies’ strictly applies to all forms of photographic copies, however, it has been used here in the narrower sense of copies which can be read with the naked eye. The term ‘microcopies’ refers to those processes in which the copy has to be read with an enlarging optical devise. The principles and uses of microcopies form a distinct discipline, and have been therefore dealt with separately.

One of the major difficulties to the proper understanding of photocopying processes is the host of technical and trade names involved. Often there is no good alternative to the trade name for a process, and the trade name has become more or less a part of common speech. A well-known example of this is the term ‘Photostat’. This is a trade name, and its use to describe any other process is incorrect and illegal. Yet so many people will freely call a Photocopy or Photostat. Similar is the case with Xerox copy which is actually a trade name of Rank Xerox Corporation.

Library Requirements

Libraries unlike Printing presses are usually require to produce single copy of documents and the original will usually be in a book or a Journal and will therefore be printed on both sides of the page. The requirements of Libraries can be summarized as follows:

- 1) The process must be capable of producing single copies from opaque or double-sided originals.
- 2) It must be able to copy from large and/or thick bound volumes.
- 3) The copy must be as cheap as possible to produce.
- 4) The process should be quick and clean and should not require a skilled operator.
- 5) The copy should be reasonable permanence.
- 6) The equipment should be reasonable in cost, should need little space, and not require darkroom facilities.

11.4 PHOTOGRAPHIC PROCESS

Reprography can be broadly divided into Photographic processes and non-Photographic processes (See Table 11.1). Photocopying using photographic process can be done by two methods, using a Camera (lens) and the other relies on close contact between the original and the sensitized copying paper (without a camera or lens). When a lens is used the size of the copy can be varied, i.e., it can be enlargement, reduction or same size. In case of contact method, the copy size will be of the same as the original (facsimile).

In this method sensitized material (film or paper) is held in the camera. The document to be copied is kept on the baseboard which is illuminated. Exposure is achieved through lens by a shutter mechanism. Thus the image of the document is captured on the sensitized material. After developing this sensitized material you get the negative copy of the original. This is then used to make a positive copy either by repeating the whole process with the negative on the copying board instead of the original or by using Direct-copying methods (Non-Camera method).

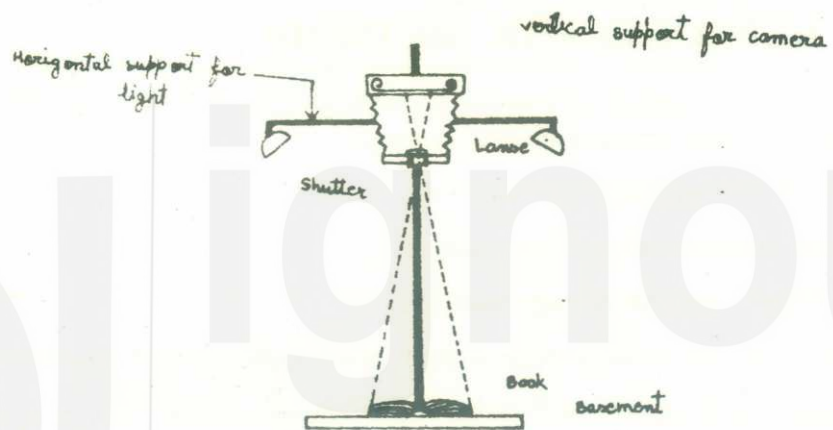
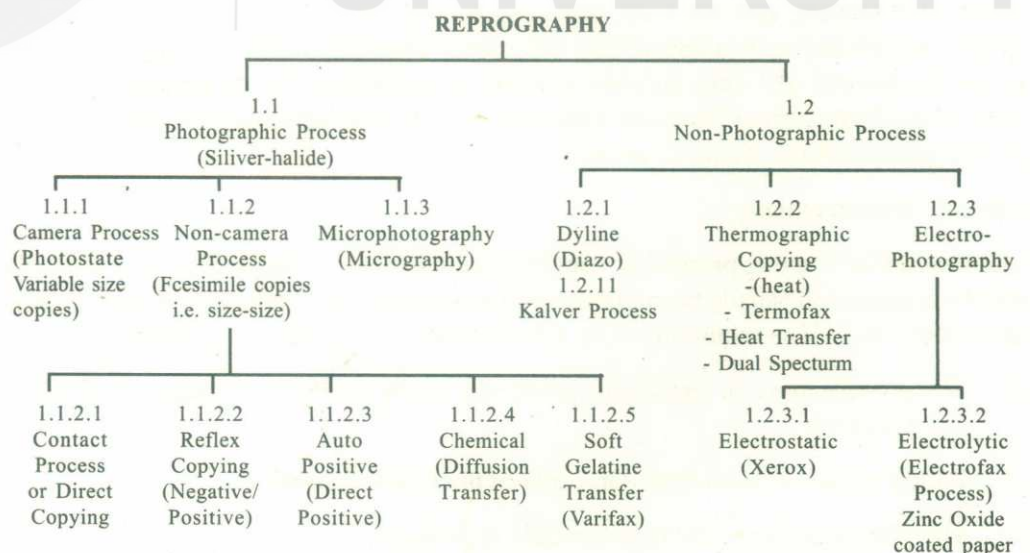
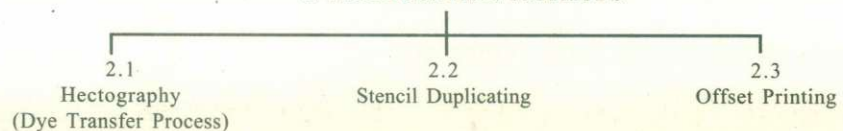


Fig. 11.1: Copying with a camera

Table 11.1: Reprography Process



2. MULTICOPYING METHODS



Photostat

This is essentially a large camera in which exposures are made on to a roll of sensitized paper. A prism in front of the lens laterally reverses the image, which means that the first copy is a readable negative. After exposure the paper is processed in a built-in processing system. Thus the exposing and developing takes place within the equipment avoiding the necessity of a separate dark-room processing facility. The Photostat camera is able to produce variable ratio copies of the originals (enlargement/reduction) because the position of the lens between the sensitized paper and the original is variable. The Photostat was a significant development of photographic method of copying. Older libraries extensively made use of Photostat machines for copying library materials including thick bound volumes.

11.4.2 Non-Camera Processes**Contact Process or Direct Copying**

This process is ideally suited for copying single sided translucent originals.

In the contact method the original and sensitized paper are placed in the closest possible contact in a light box and then exposed to light. Copies can be done as follows. The translucent original having text on one side only is placed facing the light source and the copying paper is placed with the sensitized surface against the back of the original. When exposure is made the light passes through the white background of the original but does not pass through the text because it is absorbed by the black print. The resulting copy is a readable negative and can be used instead of a positive (Fig. 11.2). This is known as 'Direct Copying'. It is also referred to as 'Contact Copying'. For copying single sided translucent originals, a special type of silver halide sensitized paper is also available which gives a positive copy directly thus eliminating intermediate negative.

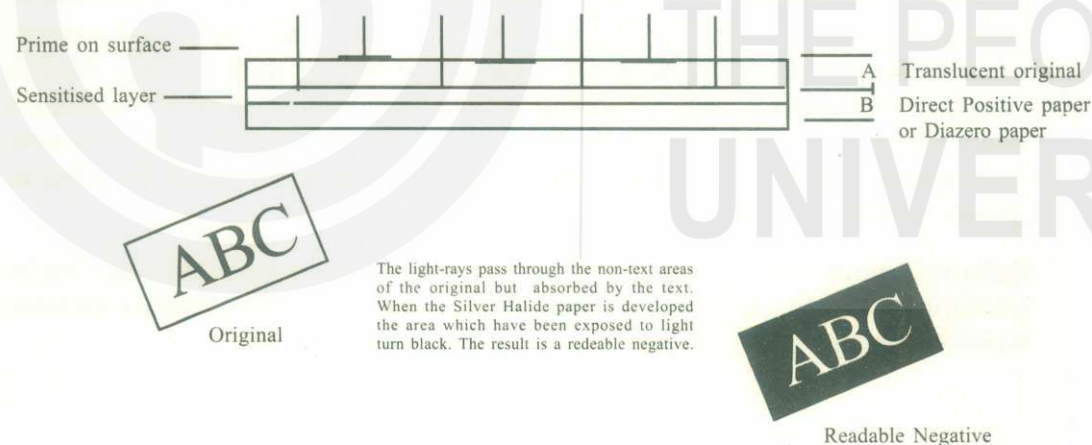


Fig. 11.2: Direct copying with silver halide paper

Reflex Copying (Negative/Positive)

If the original is opaque or has text on both sides the Reflex copying is most suitable. The copying paper is placed between the original and the light source with the sensitized surface in close contact with the face of the original. When the exposure is made the light passes through the copying paper to the original. The black areas of the text absorb the light, but the white background reflects light back to the sensitized surface of the copying paper (Fig. 11.3). The resulting copy is true negative. The direct copying method is used to make a positive copy from negatives. Although the above methods of copying gives perfectly sharp and good quality duplicate copy of the original, it is not suitable for bulk work as it is a costly and time consuming – two step process requiring an intermediate negative for getting a positive copy of the original. Therefore, this process is seldom used now in the libraries and they are of great historical importance.

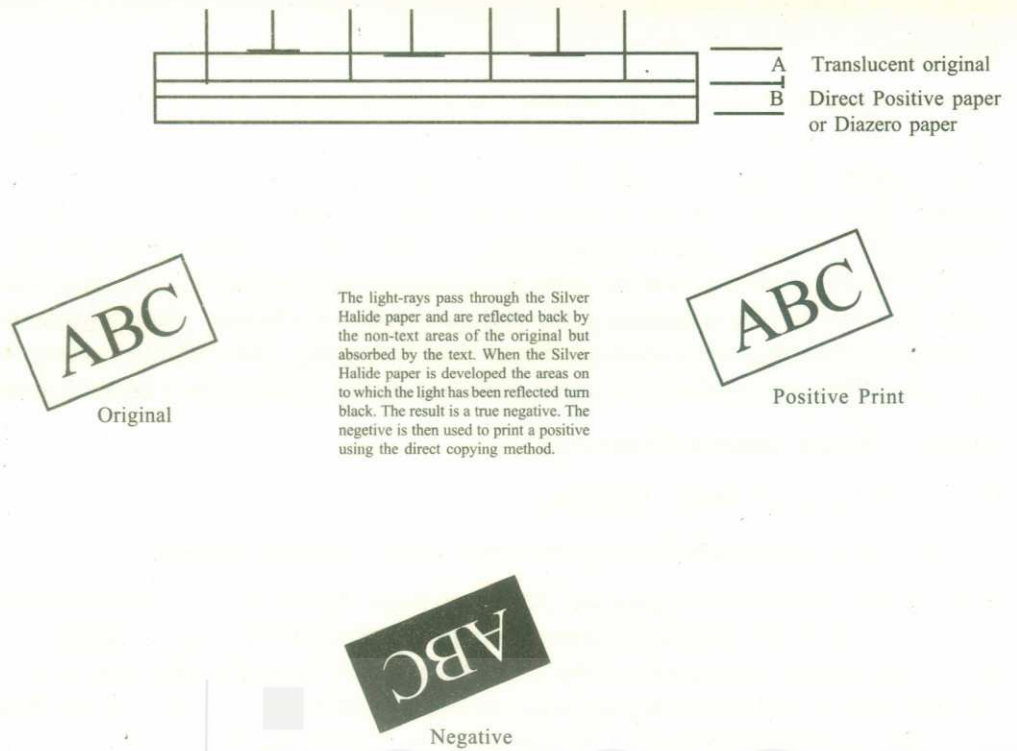
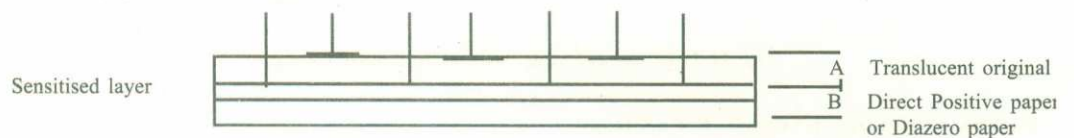


Fig. 11.3: Reflex copying

Direct Positive Printing (Autopositive)

As against the two-step reflex copying, the direct positive printing process completely eliminates the negative stage, by producing a positive copy directly in a single step involving exposure and development. The characteristics of the direct, positive or auto positive photographic paper are entirely different from other silver halide papers used either in contact printing or enlarging. Autopositive paper is coated with prefogged high contrast emulsion, which upon exposure to yellow printing light source instead of producing a heavy density has a lightening effect and if it is overexposed, no density is observed upon development (conventional). Direct positives can be made from originals by reflex or transmission copying method.

Special equipment has been designed for exposing autopositive paper, but it can also be printed in a Reflex Box using higher wattage bulbs, as it is a slow paper. Printing machines made for dyeline process can also be used for this copying process.



The light-rays pass through the non-text areas of the original but absorbed by the text. When the Direct Positive paper or Diazo paper is developed the areas which have been exposed to light remain white and the areas which have been protected by the text turn black. The result is a positive print.

Fig. 11.4: Direct copying with direct paper or with Diazo paper

The autopositive paper is processed by the usual method used for silver halide papers, i.e., developing, fixing, washing and drying.

The Autopositive Copier process was originally developed for drawing-office use, but because of its attractive features it is being used for document copying also. It is one of the cheapest methods of getting a positive copy from single sided or double-sided originals. The copy from a double-sided original will be lacking in quality and sharpness on account of the indirect reflex copying process. Weak pencil copying or old originals can be printed

on this material to yield copies of improved contrast. The Autopositive paper is also used widely for making intermediates for plan copying on diazo paper. Kodak Ltd., have introduced an Autopositive paper which can be developed and stabilized in one solution.

Diffusion Transfer Process (Chemical Transfer Process)

The diffusion transfer process which goes under the trade name "Copy rapid process or chemical transfer process" requires less time and effort for making duplicate copies. The process which belongs to the silver halide group can be used for copying virtually any type of original-single sided, double sided or translucent and also for the production of offset printing plates for small printing machine. For getting a copy of this method, a sheet of negative paper is exposed in contact with the original either by reflex or transmission method. The exposed negative paper is brought into contact with a sheet of transfer or positive paper and the two sheets are fed into the adjacent slots of a special developing machine. After about thirty seconds, the two sheets are reunited and emerge out of the machine sandwiched together. At the end of about a minute, the two sheets are pulled apart resulting in a negative and positive copy of the original. About three copies can be obtained by repeating the above process. The negative can be used, if necessary, to yield additional copies of the reflex method, after fixing and washing.



The Chemical Transfer negative paper is exposed to light in the same way as the Mechanical transfer paper. After exposure it is passed through a developing machine together with a sheet of positive emulsion coated paper. Having passed through the developer they emerge from the machine, having

been passed into close contact. During this contact the undeveloped silver salts in the surface coating of the negative paper, where they are reduced and form a positive image.

Fig. 11.5: Chemical transfer process

The negative paper is coated with silver halide emulsion. After exposure and development, it transfers the unexposed silver halides onto the positive paper on account of the solvent action of the hypo present in the positive paper which in turn reacts with the nucleating agents which are present in it to form a positive silver image on the positive paper.

The time and effort required for the production of a copy is much less compared to either reflex or autopositive processes as both negatives and positives are produced in a single operation within a couple of minutes. There are a wide range of materials for the diffusion transfer process and some varieties are suitable for use as master for dylene printing and printing down on offset plates. Multiple copies up to a dozen or more are also possible, using a special negative paper. This will result in economy in addition to speed.

Soft Gelatine Transfer (Varifax)

Varifax is another transfer process based on light sensitive silver halide compound. The negative which is called a matrix in this process is coated with gelatine containing light sensitive silver compound, a tanning developer and a dyeforming component. The matrix is exposed with the original by the reflex method and developed in an alkaline solution which has a tanning effect on the exposed areas. The areas receiving greatest exposure are hardened and adhere to the matrix and unexposed areas are dyed and partially developed during development. The matrix is brought into contact with the copy paper and a layer of unhardened dye material, which forms the text of the original document, is transferred to it. From a matrix, 6 to 10 copies can be had by repeating the transfer operation of developing the matrix and bringing it in contact with the copy paper. The matrix once used cannot be stored or reused at a later period. Varifax, which is a soft gelatine transfer process is mostly used for copying work in business establishments, where multiple copies of the single document are often required. The matrix can be transferred on to an offset paper plate for getting multiple copies by offset printing.

Self Check Exercise

- 2) List the various methods which are involved in the photographic process in reprography.

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

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

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11.5 NON-PHOTOGRAPHIC PROCESS

11.5.1 Diazo Process (Dyeline)

The dyeline process has virtually replaced one of the oldest and widely used blue print process for copying drawings, tracings or similar originals. The image formation in dyeline process depends on the chemical behaviour of diazonium salts after exposure to intense actinic light. When a transparent/translucent original carrying an opaque image in contact with the diazo material is exposed to ultraviolet radiation, the non-image areas are rendered ineffective on account of decomposition and loss of their image forming property. In the image areas, not affected by the actinic light, diazonium salt is available to react with a chemical developer or with ammonia vapour which reacts with a weak coating of acid on the diazo material for energizing a coupler in the diazo coating to form a dye image. The diazo reproduction is a positive copy of the original – a positive original produces a positive copy and a negative original produces a negative copy. The dyeline process has many advantages. It is one of the cheapest copying processes. The cost per copy size to size is about $1/7^{\text{th}}$ of silver halide paper. A wide range of equipment for copying drawings, tracings, etc. is now available in the country. This process is ideally suited to make 20-25 copies from an intermediate master. The resolution of the diazo material is extremely high because the image-forming unit in the material is the diazo molecule. High resolution coupled with low cost of the material render the process suitable for duplication processes – such as microfiche, microfilm jacket, aperture card, etc.

Kalvar Process

As an offshoot of dyeline process, Kalvar process has also entered the ever-widening field of document copying. It is a completely dry process using vesicular material for image formation. The film base is coated with plastic which contains light sensitive diazo compound. Upon exposure to ultraviolet light, this compound is broken down resulting in the formation of minute gas bubbles in the plastic. The film is developed for about a second at a temperature of about 245 F which causes the plastic to soften and bubbles to expand. As a result of these internal stresses and strains, image formation takes place. A final exposure to ultraviolet light fixes the image for permanency. As unexposed areas retain their sensitivity even after development, any required additional information can be added at a later date to the material.

Kalfax materials are available both in film and paper forms. The material can be handled in room lighting and exposures can be made in any conventional diazo exposing machines. The image permanency of Kalfax prints is greater than those made on silver halide papers, as it contains carbon. The quality of prints on Kalfax paper is superior to those made on dyeline papers. Kalfax materials are costlier than diazo materials but cheaper than silver

11.5.2 Thermography (Heat Processing)

Thermographic systems of copying use heat sensitive recording materials which produce images from temperature differences across the face of the original document when a document is briefly and intensely heated, dark (infra-red-absorbing) text areas become hotter than the white background – this is similar to dark clothings heating up in sunshine – and the differential temperature between text and background can be 20 F or more. By placing the document in contact with a material which physically or chemically changes at text temperature but not at background temperature, a visual image can be formed as illustrated in figure 11.6.

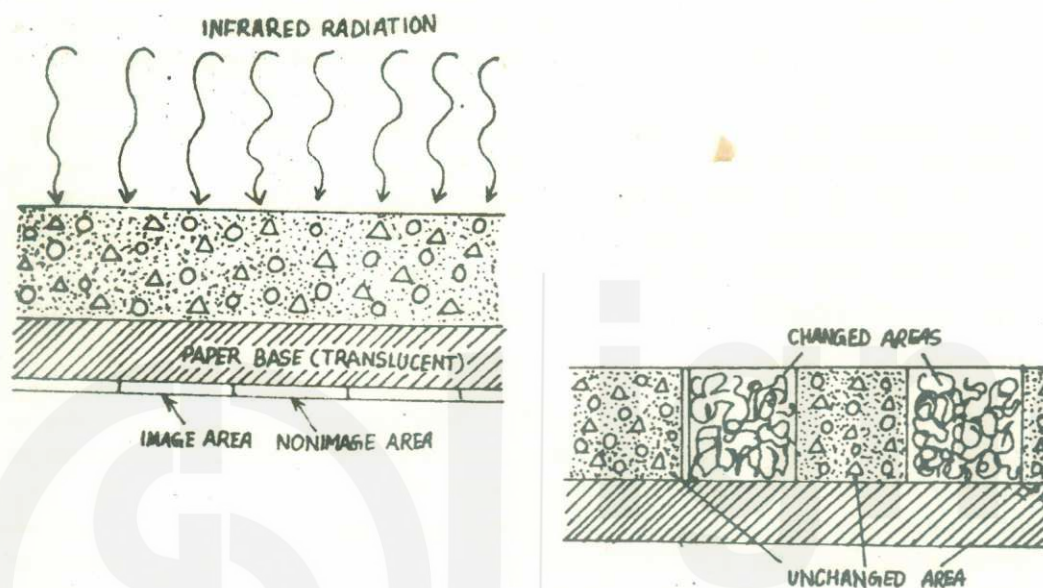


Fig. 11.6: Thermography

The first commercial copy process based upon this principle (Thermofax) was introduced by 3M Co, USA. It uses a simple unit containing a powerful infrared heat source rather like an infrared grill or space heater. The original opaque document, in face contact with a sheet of heat sensitive material, is drawn into the machine by motorized rollers. The sandwich moves quickly around a drum containing the heat source and emerges from the machine within 10-15 sec., the heat sensitive material then carries a copy of the document. Thermographic materials usually take the form of a paper, plastic or acetate sheet.

Characteristics and Uses

Thermography has the desirable features of simultaneous exposure and processing, and very rapid results. Materials can be handled in room lighting. No solutions, powders, or fumes, and operating skills are required. Thermographic copying machines are popular in offices. They are so conveniently quick and simple to operate, as to give dry, one-stage copies in a few seconds.

Thermographic transparencies will act as a dyeline masters. This is also the fastest way to prepare transparencies for an overhead projector.

11.5.3 Electrophotography

Electrostatic Process

One of the most radical departures from conventional silver halide photocopying was the development of electrophotographic methods for the formation of an image. These methods are based on physical and electrical, rather than on chemical, phenomena. The underlying principles of electrophotography are those of photoconductivity and electrostatics. Electrostatic attraction is the familiar phenomenon which occurs when two appropriate

substances are rubbed together to produce a static charge capable of attracting small objects the way a magnet attracts metal filings. In earlier times, electrostatic attraction was thought to be a form of magnetism. Photoconductors may be briefly described as substances which become more conducive in the light than they are in the dark. If a sheet of material coated with a photoconductive substance is given uniform electrostatic charge in the dark and is then exposed through a lens to the projected image of a document, light reflected from the white background areas of the document causes the electrostatic charge in the corresponding areas of the photoconductive surface to dissipate. However, in the image areas where no light has been received, the charge remains, creating what is called an electrostatic latent image. If the photoconduct surface is then cascaded with suitable, finely divided, black powder, the powder will cling to the image areas by electrostatic attraction, thus producing a visible image. To render this power image usable in the form of a copy, it must either be transferred to or formed directly on a sheet of paper or other suitable support where it can be made stable by fusing it to the support through the application of heat, vapor, or solvents. There are two electrophotographic processes in wide use for document reproduction purposes, which although based on essentially the same principles, differ in the materials and methods used. The first of these xerography (from the Greek words Xerox, dry, and graphein, to write) – employs a selenium copying on a metal plate as the photoconductor. The image formed on this plate is then transferred to a sheet of plain paper. The second-electrofax-employs as the photoconductor a thin layer of zinc oxide coated on the paper which becomes the copy. Xerography may be thus described as transfer electrophotography and electrofax as direct electrophotography.

Xerography – History

On October 22, 1938, a patent attorney, Mr. Chester Carlson, seeking a better way to copy office documents without a dark room or any wet chemicals, first transferred an image '10-22-38' (representing the date and place of invention) on the paper. He called the process electrophotography. Carlson promptly got a patent for his invention and set about selling. But there were no takers. Finally, in 1944, he was able to interest the Battele Memorial Institute, a non-profit research organization based in Columbus, Ohio. Battele agreed to develop his invention and give him a share of whatever royalties it might get. In 1947, Battele shared its rights to Carlson's invention with Haloid called the invention 'Xerography' or 'dry writing'. Between 1947 and 1960 Haloid spent about US \$ 75 million on research in Xerography. In 1958, Haloid changed its name to haloid Xerox and again 1961 to Xerox Corporation. By 1960, Haloid's struggles had begun to pay off. The decade saw Xerox go international. Now, Xerox has subsidiary or associated companies worldwide represented by Rank Xerox, Fuji Xerox and Modi Xerox Ltd. 'XEROX' is the trade name of the Xerox Corporation for their brand of copiers. However, the term 'Xerox Copy' is freely used to represent copy produced by any process. Strictly speaking this amounts to infringe of the trade name registered by the Xerox Corporation, USA. Xerography works on the principle of electro-photography or electrography. Forty-Six years later, today there are more than ten million copiers of all kinds and sizes in use throughout the world. The fastest fully automatic 'Xerox-9500 Duplicator' turns out quality copies at the rate of 120 per minute, i.e., 2 copies per second. It can copy on both sides of paper, reduce to the required size and automatically sort the copies into virtually limitless number of sets. This is just to give an idea about the exploitation of 'Xerographic technology' in the copier business today. The most significant development in the copier business was in 1970's with the entry of Japanese machines in a big way. In fact, the Japanese were only waiting for the expiry of patent rights held by the Xerox Corporation, U.S.A., over their copier technology. Immediately after that, the Japanese quickly exploited situation to their advantage by producing comparatively cheaper automatic PPCs into the market. To name some leading brand names of Japanese copiers CANON, Minolta, U-Bix, Ricoh, NASHUA, Sharp, Toshiba, etc. These copiers are very sophisticated in design with built-in microprocessor control for fault detection and quality copy output. Different models are designed with features to suit different applications in terms of copying volume (low/medium/high) and copying needs (reduction/enlargement). The price tag varies according to the features built into the machine and the brand name which assures reliability.

There are five steps entailed in the making of a xerographic copy (Fig. 11.7):

- 1) Plate charging: The photoconductive selenium plate of drum is exposed to a corona discharge in the dark which imparts a uniform electrostatic charge to its surface.

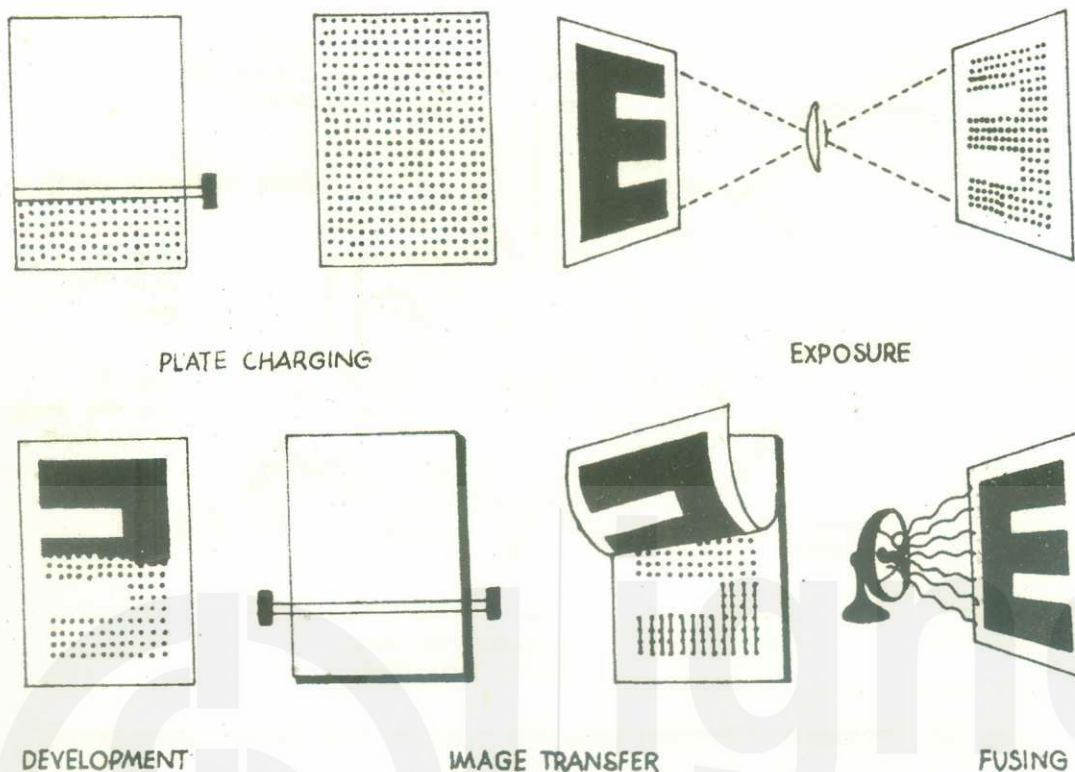


Fig. 11.7: Schematic representation of the basic xerographic processing steps

- 2) Exposure: The photoconductive surface is exposed through a lens to the projected image of a document. Light from the white background areas dissipates the charge, but, in the image areas, the charge remains.
- 3) Development: A black powder called the developer, consisting of carrier and toner particles, is cascaded over the photoconductive surface where the toner particles adhere by electrostatic attraction to the image areas.
- 4) Image transfer: A sheet of paper is placed over the photoconductive surface and the toner image is transferred to it by imparting an electrical charge of the opposite polarity to the paper surface.
- 5) Fusing: The toner image is fused to the paper by the application of heat.

Because all of the toner does not transfer to the paper, a sixth step – the cleaning off of residual toner – must be done before the photoconductive surface can again be used. In the first copiers which appeared on the market in 1950 and which are still used, principally for the production of offset plates, the successive steps were performed manually by the operator. In various types of copiers which have appeared since then, all of the steps, have been completely automated. (Automatic Plain Paper Copiers-PPC).

Materials

Three materials are employed in xerographic copying:

- 1) The selenium photoconductor;
- 2) The toner; and
- 3) The paper or other support to which the toner image is transferred.

The most important feature of Xerography is its capability to transfer the image on plain paper (not coated). This brings down the cost significantly. Xerographic images can also be transferred to spirit masters, paper or metal offset masters, or transparent plastic stocks. Modern automatic Xerox machines (Plain Paper copiers) produce excellent copies of the originals. Advanced built-in microprocessor technology enables ease of operation and high quality reproduction at low cost.

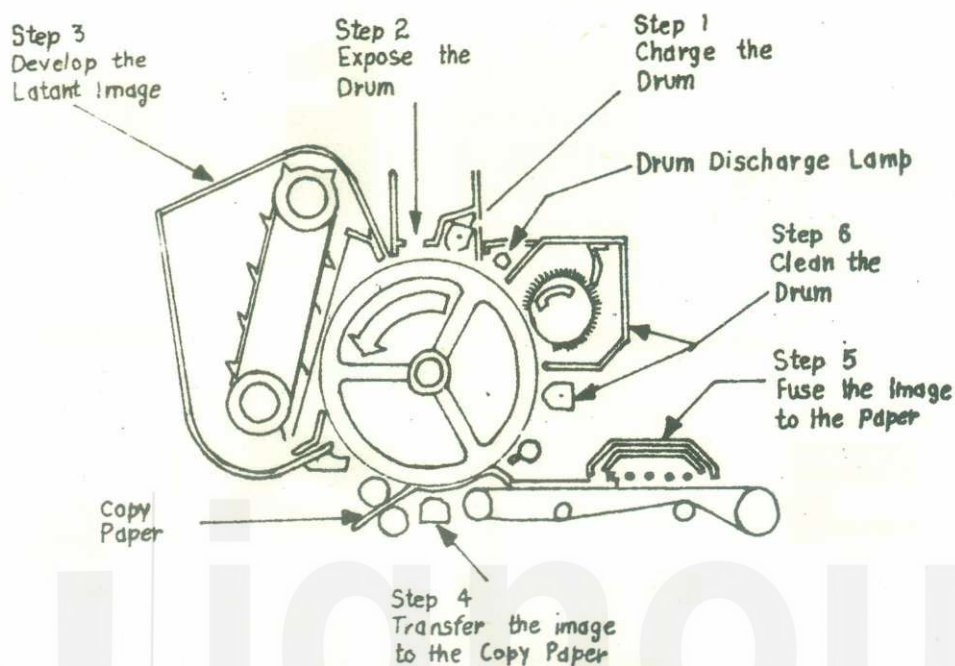


Fig. 11.8: Principles of an automatic Xerographic equipment using a selenium photoconductor.

How to Choose the Right PPC

The question of selecting the right PPC has been discussed and debated in many places. Sometimes the users ask which is the best PPC available? There is no answer to this question but selecting the right one can be properly matched. Most of the users while selecting a copier consider copying quality as most important. As so many models of copiers of different makes are available in the market making the right choice is a difficult task. In general, most of the copiers are pretty good in their design and performance. The best way to evaluate a copier is to examine carefully the following functional parameters keeping in mind the copying needs of the user organization:

- 1) Copying volume (low/medium/high);
- 2) Max. size of original;
- 3) Max. size of copy;
- 4) Reduction/Enlargement;
- 5) Copying speed in different modes;
- 6) Per Copy Cost;
- 7) Price of the machine inclusive of consumable for at least one year and essential spares;
- 8) Charge for annual service contract;
- 9) Warm-up time;
- 10) Diagnostics and copy quality control system;
- 11) Procedure for removing paper jam;

- 12) Copying on different grades of papers, letterhead, transparencies, offset masters, etc.;
- 13) After-sales service;
- 14) Background and reputation of the supplier; and
- 15) User feed-back about the performance of the machine.

Checking on the above mentioned parameters will help in narrowing down the selection to a few copiers meeting the exact requirements of the user. Copiers are designed differently to meet certain performance requirements. For instance a low volume machine cannot handle high volume workload. The heart of the machine 'drum' used in the machine could be coated with Selenium/Cadmium-Sulphate/Zinc Oxide/organic Photo Conductor (OPC). Each one of these coatings have different special response and lasting quality. The developing process could be DTT-Dry Toner Technology (Single Component/Dual Component). Lastly, the image fixing could be by pressure rollers/heat fusing. It is futile to pass any judgment on the merits or demerits of the working system or engineering aspects of the copier. The manufacturers have designed the machines after a great deal of research and development efforts. However, there are some operating advantages and disadvantages associated with each system. It would be a good idea for the user to assign some weightage points to the above factors while evaluating the machines. It may be stressed here that every machine is subject to paper jams or breakdown but in a good machine it should be possible to remove the paper jam easily and reliable after-sales service should take care of breakdowns promptly keeping the machine down time to the minimum. Last but not the least, the users of copiers should remember that plain paper used on the machine should conform to rated specification by the manufacturer relating to grammage, moisture, content, smoothness, trimming, etc. The machine will refuse to perform efficiently with bad paper. Regular maintenance and careful operation in a dust free atmosphere will keep the copier in healthy operating condition.

Electrofax Process

This process is similar to xerography but differs from it in having Zinc Oxide coated paper which serves both as the sensitive material (in place of selenium plate) and the copy paper. The print is produced directly without the transfer stage charging to full sensitivity and exposure development follows the same line as Xerography.

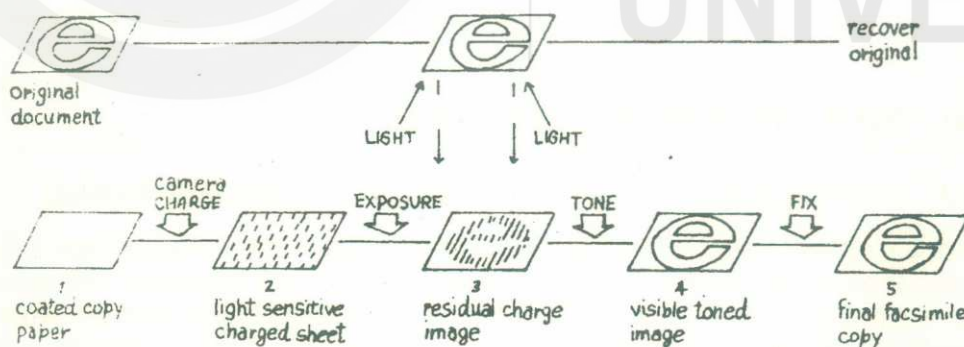


Fig. 11.9: Diagram of the Zinc Oxide electrostatic process

This is first made sensitive to light by giving it a blanket negative electrostatic charge on the (zinc oxide) coated side in the dark. One way of doing this is by ion transfer from a corona discharge. The sheet, now sensitive to light, is exposed by any of the conventional photographic procedures. The electrostatic charge is lost or reduced in the exposed areas and retained in the masked areas to form a latent electrostatic charge image on the surface of the paper. The latent image is developed by applying a pigmented resin powder carrying a positive electrostatic charge. The powder is attracted and held by the negatively charged image areas. The powder image is fixed by heat melting the resin. So it fuses to the paper surface to produce an image. Image development can be with dry powder or liquid. In liquid development a fixation process is not necessary as the liquid contains a

soluble resin. After passing through squeeze rollers the carrier fluid evaporates leaving a film of resin over the whole surface, which in turn fixes the pigmented surface of the paper. This process is more expensive as compared to xerography because of the zinc oxide coated paper. This is very popular now.

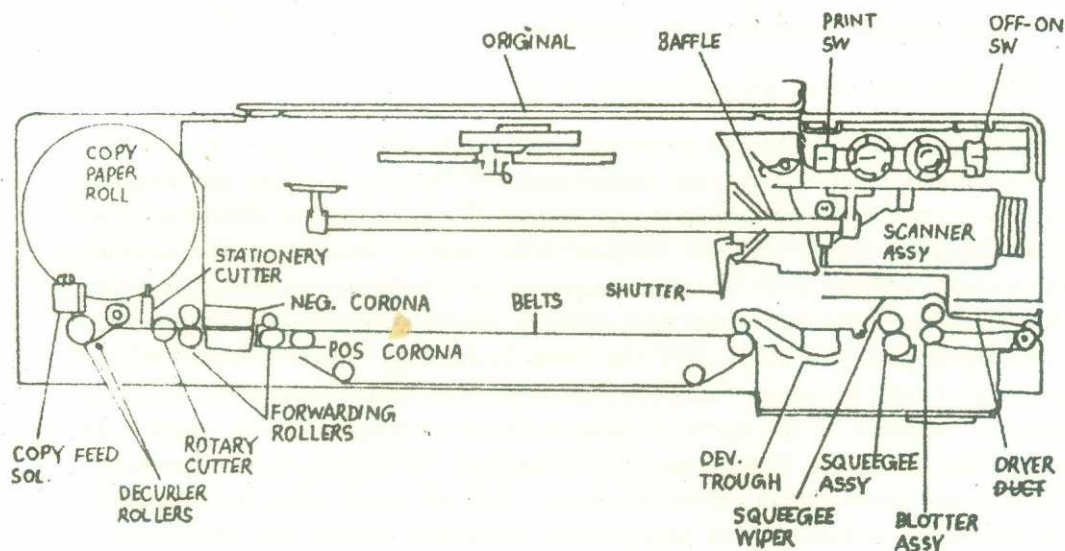


Fig. 11.10: Schematic diagram illustrating essential elements of zinc oxide electrostatic copier

Self Check Exercise

3) What are the steps involved in making of a Xerographic copy?

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

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

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11.6 MULTICOPYING METHODS

11.6.1 Hectrography (Dry Transfer Process – Spirit Duplicating)

In spirit duplicating (also known as the hectrograph process), a master, which is a specially prepared sheet of glazed paper, and a carbon-backing sheet are employed. When an image is typed or drawn on a master, a carbon image is transferred to the back of the master sheet. The master is then printed on a small press which consists, typically, of a paper feeding mechanism, a pair of rollers (one of which is moistened with a solvent), a drum on which the master is placed, an impression roller, and a receiving tray for finished copies. When a sheet of copy paper is fed through the machine, its surface is moistened with solvent from the moistening roller and then passed between the drum holding the master and the impression roller. The solvent on the surface of the paper causes a thin layer of the carbon image on the master to adhere to the paper as it is pressed in contact with the master by the impression roller. Since a certain amount of the carbon is removed from the master with the making of each successive copy, spirit duplicating is limited to relating short runs of up to a maximum of about 500 copies. Spirit masters can also be prepared from existing originals by photographic and thermographic means using DTR process. Two methods are reported for making spirit masters by DTR, developed by Agfa and Gevaert or Eichner process.

The principle of stencil duplicating is based on the passing of ink through openings in the stencil and on to the copy paper. The stencil master is usually made up in three parts. The stencil itself which consists of a thick sheet of paper with coating which is impervious to ink, backing sheet, and between these two sheet of carbon paper. The matter to be copied is typed or drawn on to the stencil. Most typewriters had a stencil setting which suppresses the ribbon and allows the metal keys to strike the stencil directly. When the stencil is struck by the key, the protective coating is removed and an opening is created in the form of the type character on the key. At the same time a copy is produced via the carbon sheet on to the backing sheet. The primary use of the backing sheet is to absorb the blows of the typewriter keys and its secondary use is to act as a surface for the carbon copy in order to facilitate proof reading. Errors on the stencil can be corrected by the application of correction fluid and retyping the letters. When the Stencil has been completed, it is separated from the backing sheet and mounted on the drum of the duplicating machine. The drum cylinder is made to rotate and ink is squeezed through perforations in the stencil and is deposited on the paper. The paper then moves on to a delivery tray for use. Rotary stencil duplicating machines were made by Roneo, Remington-Rand, Gestetner. The process is very cheap and extensively used for short runs. Even today stencil duplicating ranks next only to Xerox-cum-offset printing process.

11.6.3 Offset Duplicating (Offset Lithography)

Offset duplicating gets its name from the fact that the right-reading image on an offset master must be transferred or 'Offset' to an intermediate roller to form a reverse-reading image which, in turn, is transferred to the copy paper to form a right-reading image. The printing principle of offset duplicating is one which has been used for centuries in lithography, i.e., that water and oil do not mix. Images on masters used for offset duplicating must be receptive to the somewhat oily inks used, while the background areas must be water-receptive.

Offset duplicators are somewhat more complex than stencil or spirit duplicators; they are generally ore expensive and require greater operator skills. The offset process, however, is capable of much higher quality and much longer runs than mimeography or spirit duplicating. The essential elements of an offset duplicating machine, in addition to paper feeding and receiving components, are a series of rollers. These include a large roller which holds the offset master, rollers which ink the image, rollers which apply water to the background area, an intermediate rubbers which apply water to the background area, an intermediate rubber-covered roller called a blanket roller to which the image from the plate is transferred, and an impression roller which presses the copy paper in contact with the blanket roller (Figure 11.11).

Masters for offset duplicating are of many sizes and types, ranging from inexpensive paper masters for short-run duplicating to metal masters where very long runs must be made. Offset masters can be prepared by typing or drawing and by means of a masters can be prepared by typing or drawing and by means of a number of photographic and thermographic processes, including Verifax, Ektalith, DTR, Thermo-Fax, Ektafax, Xerography, Electrofax, etc.

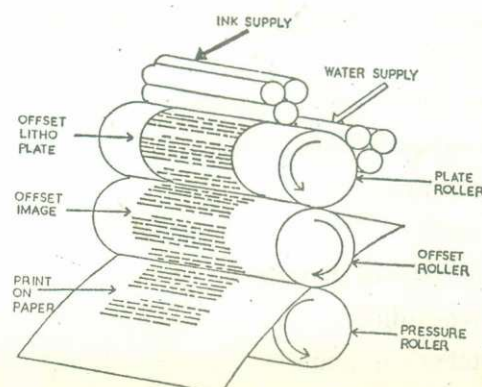


Fig. 11.11: Offset litho printing

Self Check Exercise

4) What is the principle of stencil duplicating?

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

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

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11.7 COPYRIGHT – THE RIGHT OR PERMISSION TO REPRODUCE

Until the development of photocopying, students had to take notes and make extracts by either writing or typewriting. Both these processes were sufficiently laborious to prevent any major infringement of copyright. Photocopying saves time spent in making notes, but, because of the ease with which copies can be made, publishers have felt that the sale of publications could be affected, particularly if photocopies were supplied at a cheap rate. Given the technological ability to reproduce, consideration must be accorded to having the right or obtaining the permission to make the reproduction. Much material is protected by copyright, which is the right of authors and publishers to literary property, and to the exclusive duplication and sale of such literary property. Copyright is granted by the government as a limited monopoly or form of compensation for creativity. The value of copyright in terms of money is sometimes quite substantial, and correspondingly may be jealously guarded by its owners. Material not subject to copyright restriction is known in the 'public domain'. The 'public domain' includes sometime copyrighted material for which copyright may have expired or lapsed for technical reasons, and material on which copyright claimed. If the material is in the public domain, copies can be made without hesitation. If the material is under copyright, there are certain situations in which reproduction is permitted. There is uncertainty and difference of opinion in a large area. Finally, there are situations in which permission to reproduce must be obtained and, if the copyright owner requires, fee or royalty must be paid for the privilege.

Whether material can be reproduced without legal hazard depends on the answers to an almost infinite series of questions, among which are:

Is the material free of restriction, i.e., is it in the public domain?

Is there a copyright claim?

If so, is the claim valid?

If the material is copyrighted, what are the circumstances under which one can go ahead anyway?

How many copies are to be made?

Is it to be copied in whole or part?

How large a part?

Is it 'fair use'?

What is the ultimate purpose?

Is it 'not-for-profit'?

Are the author's or publisher's profits affected?

Is it impossible to identify or locate the copyright owner?

Fair use is not as it has been termed by some, a form of infringement which is condoned. The use of copyrighted material in all ways which do not interfere with the limited monopoly granted to the author is inherent in the copyright law and constitutes the justification for statutory copyright. Historically, and basically, copyright is simply the right to sell multiple copies and to profit thereby. The difference between infringement and fair use is a matter of purpose, degree, and the effect of the copying rather than the act of copying or publishing, as such. The meaning of 'copy' in copyright is actually related to multiplication of copies and publishing for sale, and the courts have frequently ruled that copyright does not restrict the scholar from the taking of notes for individual and private use. Of course, as a matter of practicality, it would be impossible to prevent such note-taking, even if it were illegal. Most librarians would define and practice 'fair use' as that reproduction so limited in extent as not to harm the author or publisher by depriving them of profits from the sale of their publications.

On the one hand, the student or researcher who, instead of laboriously taking notes, uses a coin-in-the slot photocopy machine does not deprive the author or publisher of a sale. On the other, the professor or librarian who makes multiple copies of chapters of books for class assignments is clearly 'unfair' and violating or infringing copyright. Alarmed by the rapid growth of quick and cheap photocopying as a possible threat to sales, or intrigued by it as a hopefully lucrative source of income, some publishers and authors groups have reacted sharply. They have sought restrictive legislation and have proposed a 'clearinghouse' system to collect royalties on photocopying. Several studies have failed to show any considerable evidence of losses to publishers or authors due to photocopying. No practical or effective way of operating clearinghouse has been found.

A Word of Warning

A final word of warning is necessary. The field of copyright law is broad and complex. It is changing constantly through new legislation and judicial interpretations of existing law. Accordingly, it is advisable for librarians to keep themselves informed about the current rules governing the reproduction of copyrighted materials.

Self Check Exercise

- 5) What is the meaning of 'copy' in copyright and new 'fair use' which is actually practiced by librarians by reproduction?

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

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

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11.8 MICROGRAPHICS FOR INFORMATION MANAGEMENT

11.8.1 Introduction

Miniaturization of components has revolutionized equipment technology in today's business world. The first computer, for instance, took up a city block because it constituted a vast network of vacuum tubes. Advent of large scale integrated circuits led to smaller systems over the years and eventually the mini and micro computers are common place in today's

information centres. This trend is evident in other areas as well, like dictating machines, pocket calculators, laptop computers, mini TVs, etc.

The earliest example of miniaturization can probably be found in the micrographics field where filming of documents resulted in tremendous reductions in filing and storage areas needs. In addition to excellent space utilization, micrographics provides efficient storage, fast retrieval, archival quality, durability and security as well as other benefits. These areas have been traditionally associated with micrographics.

The following illustration gives the evolution of microforms adopted as information recording medium in various Micrographic Information Retrieval Systems (MIRS).

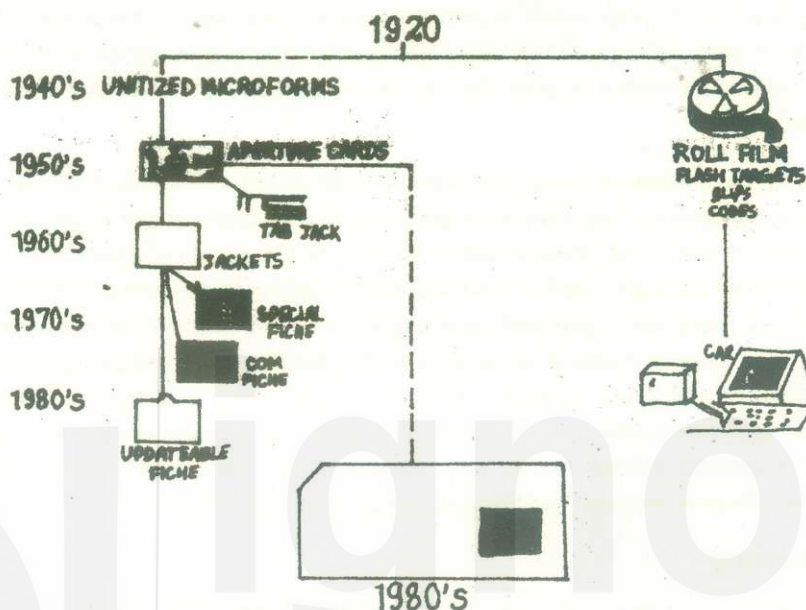


Fig. 11.12: Evolution of microforms

11.8.2 Evolution of Micrographics

Micrographics dates back to 1939 when John Benjamin Dancer, an English Scientist, reduced a 20-inch document to an image one-eighth inch in length which was visible under an ordinary 100x microscope. Two decades later, a Frenchman by name Rene Dagrón managed to photograph 1000 telegrams on a film strip 2 inch wide, small enough to be bandaged to the leg of a pigeon. During the Franco-Prussian War, the use of microfilm was dramatized by photographing secret messages and news on microfilm and attaching rolls of the film to the tail feathers of carrier pigeons that flew between Paris and Bordeaux. It's best known wartime use was V-Mail, which reduced weight of overseas mail from 2,700 tons to just 31 tons. Using 65:1 reductions, an average transport plane could actually carry up to 9,600,000 letters on microfilm reels. Microfilm, however, was regarded as little more than a novelty until the 1930s when its issue began to grow in the United States. Other businesses began recognizing the value of microfilm. During the late 1930s libraries began making microfilm copies of rare documents, newspaper files, etc. as a means of conserving storage space and preservation as the paper copies generally has a rapid decomposition rate. By the 1950s there was a widespread realization that microfilm could be used not only for the preservation of back files and oversized or rare documents but as an integral part of active information systems (as opposed to archival storage). Microform technology came into its own in the 1960s. During this period, large-scale improvements in equipment and materials were introduced. Less expensive reader-printers were made available. All these contributed to the increased application of microforms in libraries and business houses. The most important development during this decade was that the micrographics technology and Electronic Data Processing (EDP) were combined to permit direct recording on microforms – the results of computer manipulated data. This was the beginning of COM-Computer Output Microfilm. By the early 1970s, portable microform readers, sometimes referred to as lap readers, began to appear on the market, enabling

easier handling of microform documents. Standardization of microforms made significant headway early in the decade. And, by 1972 micropublishing was receiving unprecedented emphasis with more than 50 million work of microforms being produced annually in the United States. Over 25 books, journals and newspapers are now available in microform e.g., The New York Times, Times of India, Time Newsweek, Reports of the USERDA, National Aeronautics and Space Administration (NASA), etc. Today, microforms are widely used in industry, government and education.

11.8.3 Types of Microforms

The wide variety of user needs and applications has given rise to a number of different forms in which microfilm is made, stored, and used. Some of the familiar microforms are mentioned below:

- a) **Roll Film:** Microform in roll form was one of the first microforms and it is simply a length of microfilm with 16 mm, 35 mm or 105 mm in width on a reel, spool or core. Roll films can be contained in a cartridge or cassette which protects the processed film from finger prints, excessive dust, and other similar damages.
- b) **Microcard (Micro-opaque):** A micro-opaque has unitized multiple images printed on photograph paper arranged both sides and is used primarily for reading because it cannot be easily duplicated. Micro-opaques are now obsolete and are replaced by microfiches.

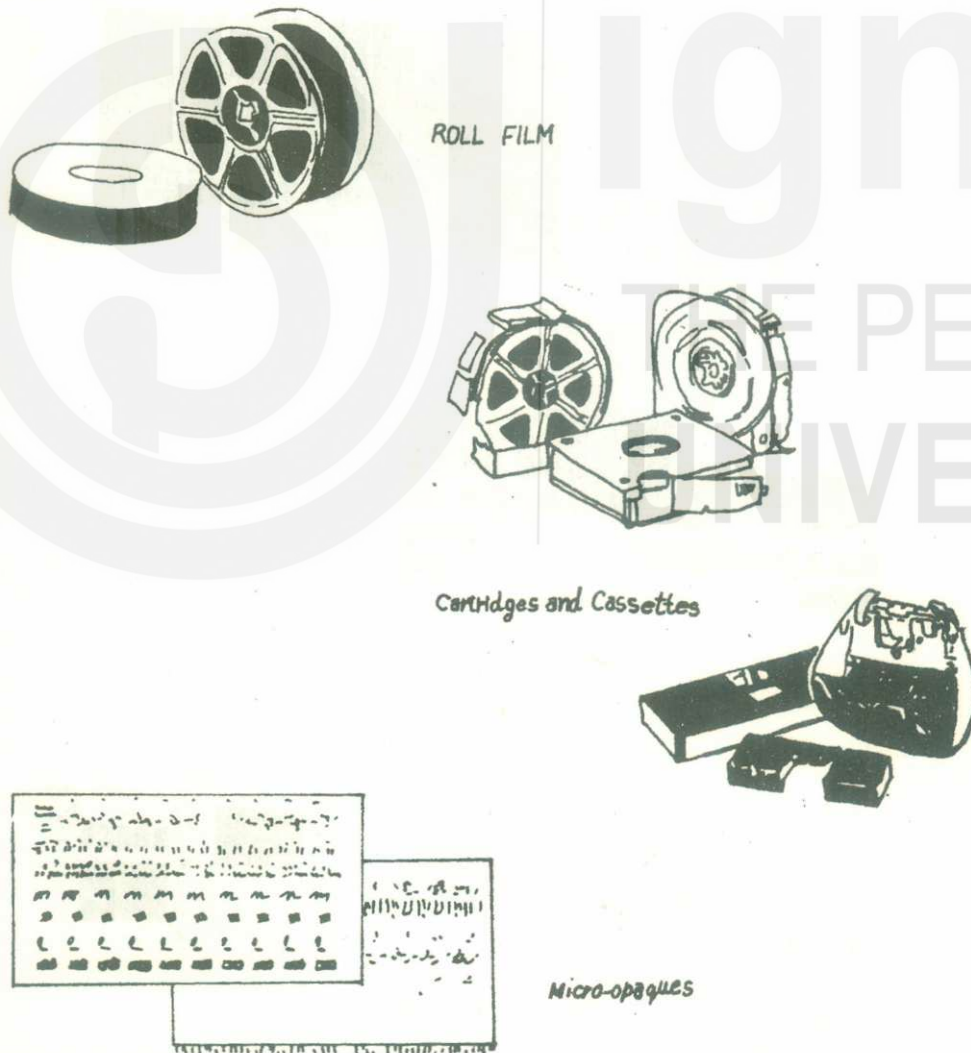


Fig. 11.13: The microform

- c) **Microfiche:** A microfiche is a sheet of microfilm containing multiple microimages (negative or positive) in a grid pattern. The microfiche usually contains identification information which can be read without magnification. A standard microfiche has

the dimension 6" x 4" or 105" x 148 mm and can take 60-98 pages on reduction scale 1:20 or 1:24 respectively.

- d) **Ultrafiche:** Ultrafiche is another form of microfiche which contains about 2000-3000 pages having high reduction ratio exceeding 90x. Ultrafiche is not in common use.
- e) **Aperture Cards:** An aperture card is an opaque tab card with 4 rectangular hole or holes designed for mounting or insertion of microfilm. The card can also contain key-punched, interpreted and printed information for identification and retrieval. It is an united medium useful for engineering drawings system.
- f) **Ultrastrips:** Ultrastrips are short lengths of processed microfilm containing material photographed at a very high reductions. These are generally created in a two-step process which consists of filming the material and then refilming this film at higher reductions. This is an expensive process requires clean room environment.
- g) **Chips:** A microfilm chip is a small, precisely cut unit of microfilm which contains microimages. These chips are stored in cartridges or cells in retrieval devices. Retrieval is done automatically by means of electronic circuitry and electro-mechanical equipment. The microfilm chip systems are not commonly available and are custom-designed primarily for special applications and are very expensive.

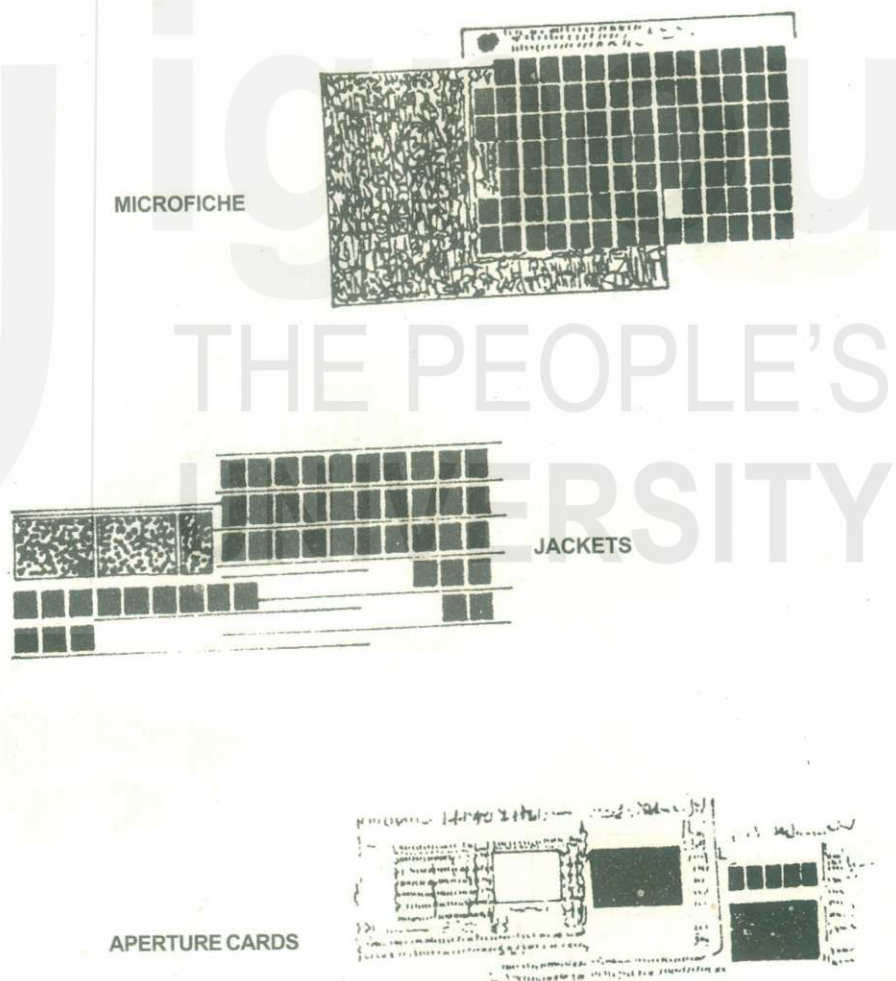


Fig. 11.14: The microforms

- h) **Jackets:** Roll film can be cut to produce film in strips which can then be inserted in jackets. The jacket is a plastic carrier with single or multiple sleeves, or channels, which are designed to hold the film strips, to protect them and to facilitate the organization of the material. The jacket has many of the characteristics of a microfiche; it can be duplicated and distributed easily and inexpensively and has the added advantage of permitting the insertion of new material or replacement of existing material within the microform.

The increase in volume and the necessity of managing huge paper systems which require multiple copies of documents filed and cross-referenced, as well as controlling the flow of incoming and outgoing documents, dictate the use of a new technology; e.g., microfilm document files supported by indexes. Microfilm greatly reduces the space problem, provides for the duplication and distribution of documents and provides easy access to materials. Moreover, microfilm alleviates the filing and out-of-file problems and protects the physical integrity of files by providing back-up and archival copies.

The rapid advances in micrographic technology during the last decade have made microform systems more responsive to user demands with the result that greater benefits are now provided to the user than are offered by the original paper system. The trend today is toward active microform systems rather than archival systems. Active systems are those in which the information recorded on film is used during the normal course of business in place of the original paper. In contrast, an archival system is one in which information is recorded for safe preservation in the event of the original information is accidentally destroyed. In an archival system, the filmed copy is not expected to be used in the normal course of business.

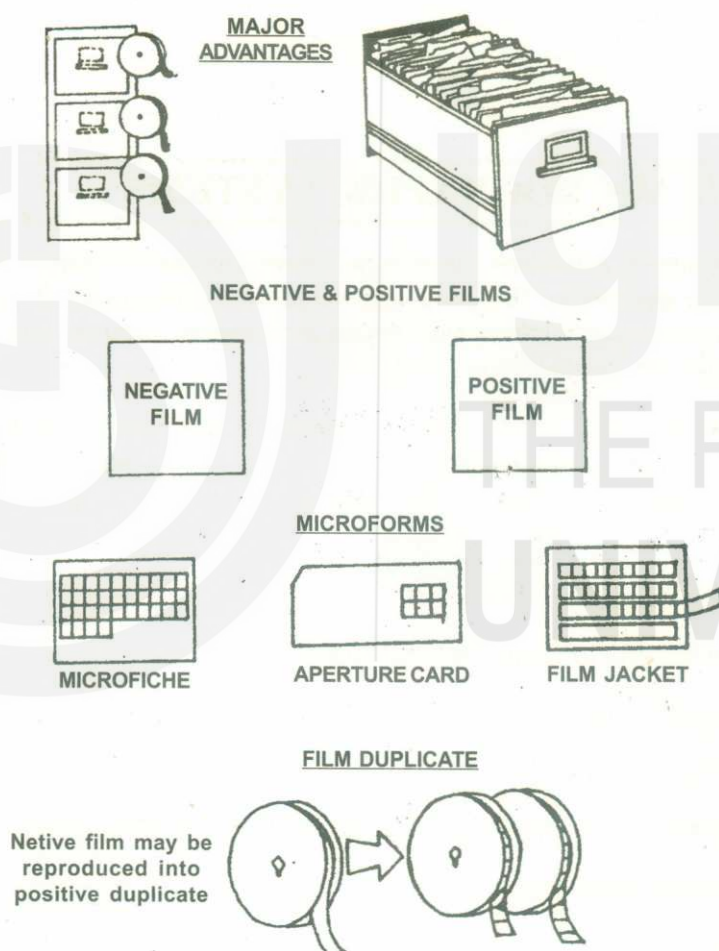


Fig. 11.15: Micrography illustrated – salient points

Advantages of Microfilm Systems over Existing Paper Systems

- i) Records on microfilm need only 4 per cent of the space occupied by the same records on paper. The original materials can be stored or destroyed.
- ii) Duplicate microfilm files can be prepared at a nominal cost and kept at other locations for use there and to provide a second set, should the first be destroyed.
- iii) Records on microfilm are in a fixed sequence guarding against misfiling, mislaying, alteration or loss.

- iv) Valuable man-hours are either eliminated from sorting and filing paper records or channeled into more productive work.
- v) Regardless of the original document size, images are reduced to fit standard microfilm dimensions for convenient handling.
- vi) Paper copies of the original documents can be produced in seconds from the microfilm images. The microfilm will provide an archival record of historical significance to future researchers.

Self Check Exercise

- 6) List different types of microforms.

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

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

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11.9 THE MICROGRAPHIC SYSTEMS

Before a new system is introduced into an organization, thorough evaluation of the existing system should be undertaken. This evaluation includes all parties involved, both those who generate the information and those who use the information, to ensure that the problems and goals of all participants are assessed.

A system is an assembly of methods, procedures or techniques united by regulated interaction to form an organized whole. In microform systems, machines are considered to be an integral part of the system. Microform Retrieval Systems include the following components:

- the microform;
- the hardware used to create the microform;
- the coding techniques;
- the indexing techniques;
- the hardware used to retrieve, display and print from the microform;
- the work procedures; and
- the people.

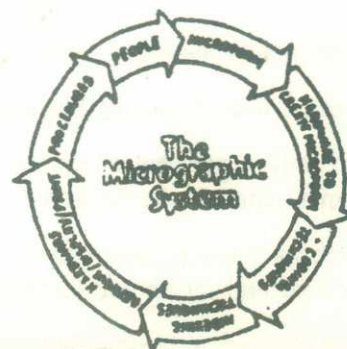


Fig. 11.16: Components of micrographic system

11.9.1 Selection of a Microform Retrieval System

Microforms are not a panacea and one microform system cannot satisfy all the requirements of all users. Many elements make up a microform system and all must be considered when choosing to employ one system. The entire range of considerations involves the type of material to be filmed, organization of the file, retrieval requirement, type of equipment and associated the system selected will meet each user's needs. To illustrate this point, newspapers are best handled on 35 mm film, bank cheques on 16 mm film technical reports on microfiche and engineering drawings on aperture cards.

11.9.2 Roll Microfilm System

Design of a retrieval system begins with the selection of an appropriate microform. Each type of microform has its own advantages and disadvantages depending on the application. The roll format in 16 mm or 35 mm loaded on to open spools or into cartridges or cassettes is compatible with a variety of retrieval techniques ranging from simple odometer indexing to sophisticated computer-based systems. Difficulties involved in the updating on microfilm files are a general drawback of roll formats. This problem can be alleviated by stripping and inserting roll film into microfilm jackets. Jackets offer space-saving miniaturization with a minimal reorientation of work procedures.

11.9.3 Retrieval of Microfilmed Documents

Finding paper documents in files has been a problem. It seems logical that reducing them to tiny images on film would make them even more difficult to locate. However, this is not the case, for while they are reduced in size, they are made more uniform. This results in improved file arrangements with corresponding easier and faster retrieval of special documents.

Roll Film: Roll film can be coded in several ways for visual or automatic retrieval. A brief description follows:

- a) *Flash Card* – Documents are sorted or grouped and each group is identified with a number. As the groups of documents are microfilmed, a card with the identifying number for each group is also microfilmed. The card image is preceded and followed by a clear film space. As the film travels through the reader, the space and card number signal the desired group of documents which the operator then looks individually to find the one he wants.



Fig. 11.17: Flash card

- b) *Code Lines* – Another method for locating groups of related documents is to have horizontal line between the documents spaced escalating positions from the bottom to the top of the image. These lines are automatically exposed as the documents are microfilmed. As the film move through the reader, the line appears to rise or fall as the film advances or rewinds. A number of strip is located on the reader screen. When the code line matches a number on the strip, a particular group of documents has been located. The operator then selects the specific document he needs.

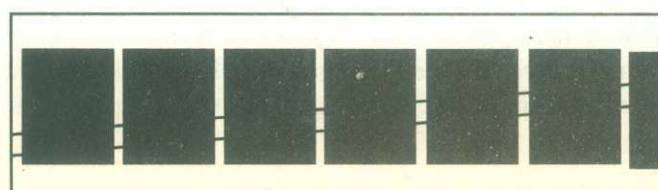


Fig. 11.18: Code lines

- c) *Sequential Numbering* – This method of coding consists of automatically stamping a sequential number on each document as it is microfilmed. These numbers appear on the screen and location of a specific document is simply a matter of locating the correct number.

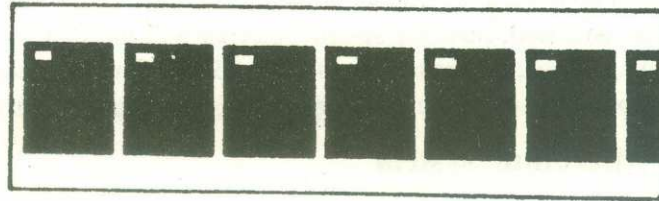


Fig. 11.19: Sequential numbering

- d) *Image Control* – For faster document retrieval, the image control method operates with push button ease. As each document is microfilmed, a small rectangular mark is automatically exposed next to each image. To find a document, the operator enters the document number in a keyboard, coupled with a reader, and pushes the search button. The marks are electrically counted at high speed and the reader stops with the desired document on the screen.

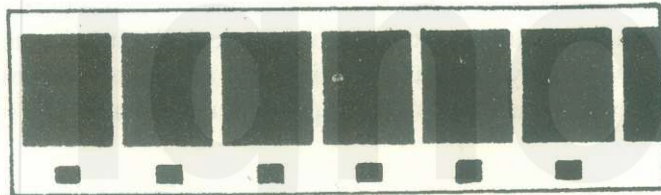


Fig. 11.20: Image control

- e) *Binary Code Patterns* – This is the most sophisticated method for retrieving microfilmed documents. As each document microfilmed, a code pattern describing the document is also exposed on the film. To retrieve a document the operator merely enters the desired code number on a control keyboard. The reader electronically scans the code patterns and stops at the one or more images that meet the requirements of the code that was entered into the control keyboard. All this takes place in a half-minute or less. This method of microfilming and retrieving documents is accomplished with KODAK MICROCODE II Equipment. This equipment provides for microfilming and encoding, locating and retrieving and producing, dry paper prints of any document.

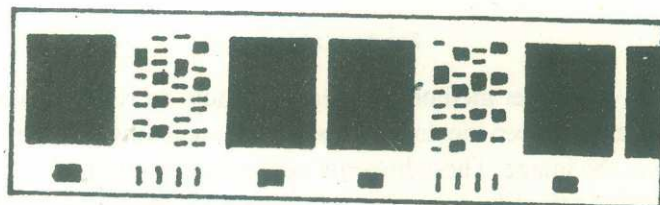


Fig. 11.21: Binary code patterns

- 2) *Aperture Cards* – In many respects aperture cards have the same filing and retrieval capabilities as jackets and microfiche. However, there is one important difference. It is possible to use aperture cards in machine records handling systems. They can be printed and sorted by machine. Frequent slave decks of cards are used for the machine sorting, printing and punching so that the master cards with film inserts can be preserved.

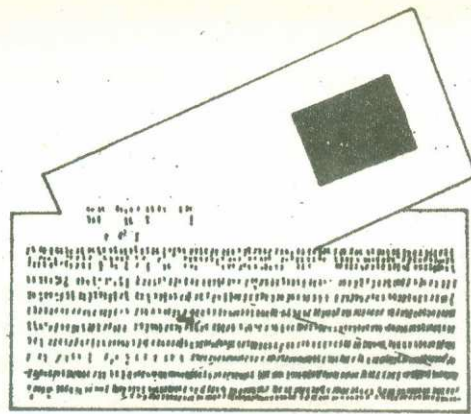


Fig. 11.22: Aperture cards

- 3) **Jackets, Microfiche** – Both of these microforms are basically the same with respect to retrieval. Each has a title header for identifying numbers and titles. Each jacket or microfiche contains a group of images arranged in logical sequence so that, when placed in a microfiche reader such as the RECORDAK ESAMATIC Readers, or the KODAK EKTALITE Readers, the particular image desired can be found both easily and rapidly.

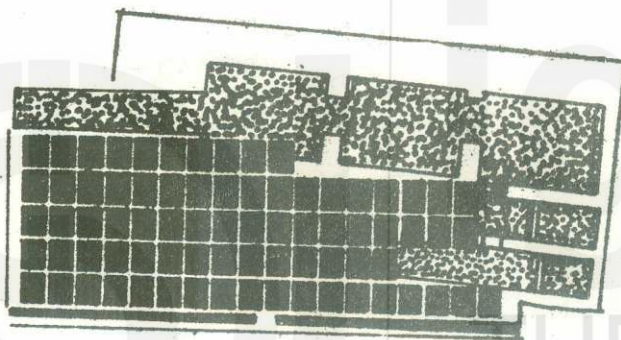


Fig. 11.23: Jackets, microfiche

Self Check Exercise

- 7) Mention the components of Microform Retrieval System.

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

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

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11.10 MICROGRAPHICS AS AN INTERFACING TECHNOLOGY

Interfacing of micrographics with other technologies is of more recent origin. This is seen by many industry leaders as significant for the film medium in the role it will play in development of the automated, integrated information systems.

11.10.1 Computer Output Microfilm (COM)

Because of high speeds at which computers could deliver processed data and vast quantities of information computers could generate, COM offered an economical alternative to paperwork. Handwar and microforms also were developed to make micropublishing a practical reality. COM devices are now available that utilise dry film and laser technology, e.g., KODAK KOMSTAR 100/200 Microimage Processors. These COM systems can operate on or off-line with host computer and have high speed dry non-impact printing capability on films. The output can be microfiche or 16 mm roll film at speeds up to 10,000 pages an hour. Growing acceptance of COM is evident because of reducing system costs, service bureau reliability and greater user ease with film. Though in India COM is yet to be introduced many leading organizations using computers extensively will have to adopt it sooner or later.

11.10.2 Computer Assisted Retrieval (CAR)

There are many similarities between a Computerised Information Handling System and Micrographic Information Retrieval System (MIRS). In both the systems, it is necessary to capture, store and retrieve information. To capture data in a computer, you have to key-in or use optical scanning, whereas in a micrographic system you will be using a camera. Computers store data on disc drives and other ancillaries, in a micrographic system film is the storage medium. To retrieve information from a computer, you may use

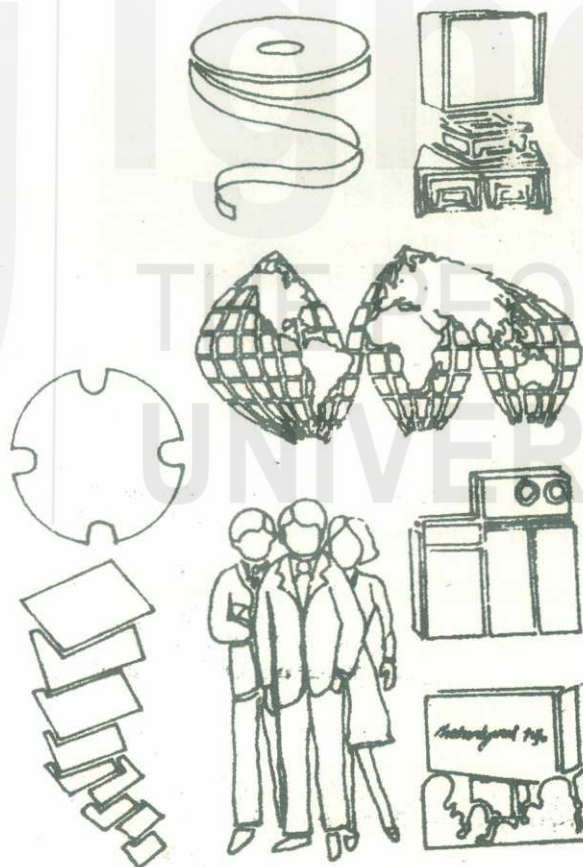


Fig. 11.24 : COM

a console terminal and printer and in case of a micrographic system you will require console Reader-Printer with a searchable key board and a display screen with printing attachment. Due to such close similarities computers and micrographic systems are used in conjunction with each other for achieving maximum speed and accuracy in information management. Computers are capable of performing high speed operation such as sorting and computations on large data bases. Micrographic systems can store enormous data or information records and can quickly retrieve them in ready usable form in a cost-effective manner. Combining data processing technology with micrographic technology to create

There are many explanations for growth of CAR. Computer intelligence is getting less costly and users can afford dedicated minicomputer for CAR. CAR actually operates on two steps. Computer is put to use as interactive logical search processor, while micrographics takes advantage of its low cost and compaction capabilities to store and display information. CAR can be employed in a variety of configurations, data bases and applications. It serves all types of microforms, both roll film and various unitized formats (microfiche, jackets). It can be used in conjunction with manual, semi-automated and fully automated storage and retrieval devices.

Self Check Exercise

8) What are the advantages of Computer Output Microfilm (COM)?

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

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

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11.11 MICROGRAPHICS – THE FUTURE

Today, microprocessors are doing things that required large mainframe computers ten years ago. Powerful mini-computers are available and the cost is going down each year. This healthy trend points to large application potential to CAR and COM systems. Perhaps software is the largest stumbling block which is rather expensive to develop for specialized applications. For standard application areas custom-tailored software packages are readily supplied by the hardware manufacturers. Many are developing their own software for driving CAR systems. Word Processors have come in a big way responsible for generating records and indexes that can be loaded to computers to create and operate CAR systems. These new technologies are compatible for interfacing with Micrographics with great many advantages. Thus micrographics offers a new dimension for better Information Management.

The future development of micrographics depends on the developments that are taking place in related technologies to evolve absolute compatibility for interfacing. Digital information transmission through word processors, COM, CAR, etc. has succeeded in facsimile transmission information records across distances linked by telephone cables. Video text recording technology is also developing as a contender for handling information retrieval problems. Updatable microfilm has been successfully developed for handling information records requiring frequent updating. This holds a great promise for the development of many micrographic systems for whom lack of updating capability was a major bottleneck. The future is for high technology micro-electronics and communication technology in the arena of Information Management.

To sum up microforms are useful for both library and information management. Microfilms provide great advantage of space saving and archival preservation of valuable documents in the libraries. Microfilmed documents can be used for inter-library loans. Mailing microfilm is far more cheaper than paper documents. Microfilm duplication is inexpensive, any number of copies can be made and distributed by air-mail. Many micrographic systems both stand alone units and integrated systems using interfacing technologies exist for information storage and retrieval.

Micrographic systems are being used by many libraries, information centres. Financial Institutions like Banks and Insurance Companies, Hospitals, Engineering Industry, Airline, etc. The greatest advantage of microfilming technology over digital imaging technology (computers, optical disc) is that microfilm images are basically photographic images hence they will not get affected or destroyed accidentally due to system failure/electrical/magnetic field disturbances, etc. The only care necessary to preserve the microfilm document is to store them in air-conditioned atmosphere to keep humidity, dust and temperature under control. Microfilms can be preserved safely for long periods as long as they are stored in air-conditioned room. This will help controlling temperature, humidity and dust.

11.12 SUMMARY

This Unit has made you aware of the terms 'Reprography' and 'Micrography'. In this Unit you have also been familiarized with the reprographic methods. A chart has been provided which highlights the major reprographic process namely photographic, non-photographic process and also mentions multicopying methods like hectography, stencil duplicating and offset printing. A detail description of these methods are provided with the help of illustrations and figures in the text. In this connection the copyright and its implication to library reprographic service is also discussed. A librarian should be well informed about the current rules governing the reproduction of copyrighted materials.

Apart from reprography in micrography the excellent space utilization can be made and micrography can also provide efficient storage, fast retrieval, archival quality, durability and security, etc. Different types of microforms are discussed in the text with the help of figures and illustrations. Application of micrographics in library and information storage and retrieval is also mentioned. The components of a micrographic system such as, microform, hardware, coding techniques, Indexing technique and work procedure, the people are listed. This Unit also describes the roll film system with the help of illustration.

Interfacing of micrographics with other technologies is of mere recent origin. Computer output microfilm (COM) and Computer Assisted Retrieval (CAR) underline such interfacing. Lastly, the future development of micrographics depends on the developments that are taking place in related technologies to evolve absolute compatibility for interfacing. Micrographic systems are being used by many libraries. Microfilms can be presented safely for long periods as long as they are stored in air conditioned rooms.

11.13 ANSWERS TO SELF CHECK EXERCISES

- 1) There is a wide variety of reprographic equipments available in the market. Making the right choice is a difficult task. The below mentioned factors are to be kept in mind while choosing a reprographic equipment:
 - a) Running cost (cost per copy);
 - b) Initial costs;
 - c) Quality of copy;
 - d) Type of original to be copied;
 - e) Speed and convenience;
 - f) Skill in use; Staffing; and
 - g) Permanence.
- 2) Photocopying using a photographic process can be done by two methods only:
 - a) Camera Process.
 - b) Non-Camera Process.

In Camera Process the Photostat methods is used and in Non-Camera Process the below mentioned methods are used:

- a) Contact Process and Direct Copying;
 - b) Reflex Copying;
 - c) Direct Positive Printing;
 - d) Diffusion Transfer Process; and
 - e) Varifax.
- 3) There are five steps entailed in the making of a xerographic copy. They are:
- a) Plate Charging;
 - b) Exposure;
 - c) Development;
 - d) Image Transfer; and
 - e) Fusing.
- 4) The principle of stencil duplicating is based on the passing of ink through openings in the stencil and on to the copy paper.
- 5) The meaning of copy in copyright is actually related to multiplication of copies and publishing for sale, and the courts has frequently ruled that copyright does not restrict the scholar from the taking of notes for individual and private use. Most of the librarians define and practice 'fair use' as that reproduction 20 limited in extent as not to harm the author or publisher by depriving them of profits from the sale of their publications.
- 6) Types of microforms:
- a) Roll film;
 - b) Microcard;
 - c) Microfiche;
 - d) Ultrafiche;
 - e) Aperture cards;
 - f) Ultrastrips;
 - g) chips; and
 - h) Jackets.
- 7) Components of microform retrieval systems :
- a) The microform;
 - b) The hardware used to create the microform;
 - c) The coding technique;
 - d) The indexing techniques;
 - e) The hardware used to retrieve display and print from microform;
 - f) The work procedure; and
 - g) The people.

8) Advantages of COM:

- a) It offers an economical alternative to paper work.
- b) Hardware and microforms also were developed to make micropublishing reality.
- c) With COM devices dry film and laser technology can be utilized.
- d) COM system can operate online and offline with host computer and have high speed dry non-impact printing capability on films.
- e) The output can be microfiche or 16 mm roll film at speed upto 10,000 pages an hour.

11.14 KEYWORDS

Clearing house	: An organization that collects and maintains records of research, development, and other activities being planned currently in progress, or completed; it provides documents derived from these activities, and referral services to other sources for information relating to these activities.
Miniaturisation	: A copy of the document which is greatly reduced and usually read or reproduced by means of optical aids.
Opaque Microcopy	: A microcopy made on opaque, or non-transparent, material, usually paper or card. Also called micro-opaque.
Optical Devices	: Making a copy of a document on photographic material in the same scale, or one different from the original.
Sensitized Material	: Material used in documentary reproduction which is coated with an emulsion sensitive to light or heat as used in a thermographic process.
Translucent Screen	: A sheet of glass treated in some way (ground, opal, coated, etc.), or plastic, on to which an image is projected in a microfilm reader.

11.15 REFERENCES AND FURTHER READING

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