# ADOPTION OF CD-ROM IN LIBRARIES

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*Describes briefly CD-ROM — its characteristics, advantages, limitations and mechanisms for recording and reading information. The basic configuration of a CD-ROM system and some guidelines for its installation are given. The major attempts made to effect standardization in installation and operation of CD-ROMs are reviewed. Applications of CD-ROM in libraries and information services in compact disc format are enumerated. Gives a brief account of his experience with CD-ROM at DESIDOC. The future trends like networking and use of erasable optical discs and the influence of these developments on Indian libraries are discussed.*

## 1. INTRODUCTION

Due to the complexities and high cost of online information searching, readers find it easier to use CD-ROM. Its use offers unlimited access to databases at a fixed cost, interactive searching in comparison to hard copy or microfiche. In addition, it provides the potential to browse, though it is a single-user system. CD-ROM may not replace online services or hard copies completely, but it does offer an alternative option to searchers.

CD-ROM is the acronym for 'compact disc - read only memory' and is one of the types of optical discs. It uses digital audio compact disc (CD) system for storage and retrieval of information. This medium is not a replacement for any existing medium like print, microforms or magnetic online; rather it supplements all these media. Presently, it is a useful medium available at a low cost. Moreover, it has reliability, permanence, durability, high capacity and scope for mass data distribution. It is free from the risk of demagnetization and other causes of data loss due

to mishandling of the magnetic media. At the same time, it does not require any back-up files for storing as in the case of online media.

## 2. CHARACTERISTICS

A CD-ROM disc (12 cm. dia ) can store 600 MB of data, which is equal to

- 2,75,000 pages of text or
- 1,500 floppies (5.75" DD-DS discs) or
- 9,000 pages of graphics and 8 bit stereo audio or
- 18,000 pages of computer graphics or
- 4,500 hours of digitized voice (16 KB) or
- 10 copies of commonly used 20 volume encyclopaedia.

The CD-ROM has established itself as an efficient, fast and cheap medium. Its replication can be done just for $2.75 a disc within a 60-day turn around. The projected life of 10 years for CD-ROMs at the initial stages has been enhanced to 30 years for write once read many (WORM) type discs, which now stands at 100 years according to Sony Corporation. These discs are small, light and robust and inexpensive to distribute by mail or other means. Even though retrieval of information through CD-ROM is a bit slower as compared to optical discs, information can be accessed randomly. Since it is very much a user-friendly system, no training is needed for its operation. It has the following advantages:

- high storage capacity,
- low production cost,
- high archival life,
- easy portability,
- speedy retrieval,
- ease of use, and
- safety of data.

## 3. LIMITATIONS

This technology is now at an early post-experimental stage. It requires minimum understanding to start the computer and then use the CD-ROM disc. CD-ROM access time is lower than in the magnetic disc or semiconductor memory, because of its constant linear velocity (CLV) format. Therefore, database retrieval software has to be modified to overcome this limitation. One cannot write, store or alter the data after *mastering* (the process of making an original plate which is sub sequently used for making multiple copies) the disc because of its read only memory. So, it is an alternative to the present-day magnetic floppy discs, but it cannot replace them totally. In this context, it is easier to pick up a book or journal and read, as and when desired than using a CD-ROM disc.

## 4. RECORDING/RETRIEVING OF INFORMATION

Information is stored digitally in the form of 'pits' and 'lands' of variable lengths on the concentric/spiral tracks of reflective layer of CD-ROM disc. Basically, there are two methods of recording data on these discs:

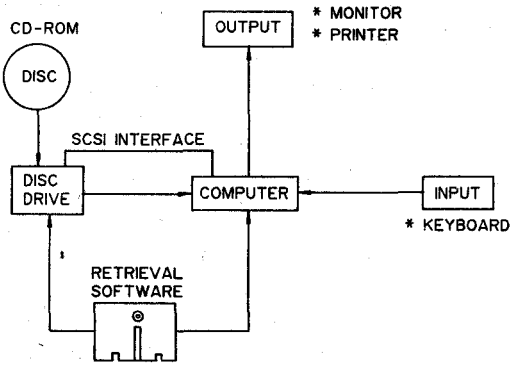
i) *Constant Angular Velocity (CAV) Method* : This method is similar to ordinary phonograph recording, where data is stored on concentric circles and the data packing density decreases from circles near the centre to those towards the periphery. Here, its disc drive rotates at a fixed speed and picture frames can be recorded for each revolution.

ii) *Constant Linear Velocity (CLV) Method*: In this method data is stored on the spiral track, and the packing density of data from the outer circle to the innermost circle is uniform. The speed of rotation of the drive is controlled, so that the speed of the outer circle is slower than the inner circles. By this method data can be accessed by block address.

For fast random access of data, the disc is spun at CAV, so that all tracks per revolution have the same division in sectors, each having the potential to store the same amount of information. Hence, the inner track has higher density. The latest method is to burn holes in a high absorbing layer on the rear side of a transparent substrate by focusing a low powered laser beam e.g. Al-Ga-As. In the

beginning a good coding system is chosen for writing data on the disc, so as to avoid cross-talk of powerful recording spot in the check signal. The check laser is given a different wavelength from that of the recording laser.

Data/information is retrieved by translating the position of 'pits' and 'lands' into a time-dependent signal. Reading is done here by a non-contact method which is free of wear. The information can be protected against dust and damage by simple coating with a transparent lacquer layer. Moreover, non-contact allows the fast random access, which is of great importance in data storage and retrieval.




## 5. SYSTEM CONFIGURATION

The hardware components in this system are: i) IBM PC XT/AT or IBM compatible, Macintosh or Apple II type of microcomputer with 512 KB RAM which includes (i) computer, monitor, magnetic disc drive , (ii) CD-disc drive, (iii) interface card, (iv) cables, and (v) printer. The CD drive is used to read the disc which is available either as a stand-alone unit or an integral part of a PC. Some of the CD-ROMs available are Philips CM 100, CM 110, CM 121, CM 131, CM 132, CM 201, CM 210, Hitachi's CDR-1502s, CDR- 1503s, CDR-2500, Sony's CDU 100, CDU 200, CDU 5002, Reference Technology 500 Data drive, and Thoshiba's XM-2000A.

Connecting CD-ROM drive with a PC is not as simple as plugging a VCP into a TV set. It requires an interfacing card for interfacing the CD drive with IBM PC. The standard and commonly used interface is the IBM-based small computer system interface (SCSI), which is available in most of the latest PCs. The other interfaces available include a high speed serial interface RS-233C, RS-432, IEEE 488 parallel interface, etc. Philips CM 153, CM 154, CM 155, Hitachi's IF 13, IF 14, IF 14A, and Sony's CD B-200, B-231 are some of the models available.

CD-ROM software is linked to the operating system of the microcomputer because the information is not only transferred from the disc to the computer, but also written on that computer's hard disc/floppy drive.

## 6. INSTALLATION OF THE SYSTEM

All the vendors, irrespective of the make of their system, provide adequate instructions for installation. But sometimes the supplier may forget or be reluctant to supply the related manuals along with the drive and interface. This causes delay in installation of the system. Once we receive the hardware, i.e., drive, interface card, related cables, system installation software and the manuals, hardly two hours are needed for installing the system. The main steps in the installation of the system are:

- setting of jumpers, depending upon the type of computer attached, as given in system specification manual,
- fitting the interface card in the host computer,
- connecting the host computer to the disk drive with the interface cable, supplied along with the disk drive, and another power cable of the drive for running the disk drive,
- setting of DIP switches if they are not pre-set,
- installing the system software in the host computer from the diskettes supplied along with the hardware, and

- loading the database software for reading and retrieving the information from compact disc.

Anyone with basic knowledge about the computer can use the system easily. One can search the database easily with the help of the manual.

## 7. OPERATIONAL CONDITIONS

The recommended operational conditions for these systems are : temperature 5-35 degree C , 20-80 per cent humidity and 220-240 V power supply for Indian conditions (European model). Normally, the drive should not be moved during operation, because error is likely to occur in the reading operation. It is always advisable to avoid sudden changes in temperature where the system is installed.

## 8. STANDARDIZATION

Philips and Sony have prescribed CD-ROM standards and have prepared red, yellow and green books. The yellow book covers the physical recording standards for CD-ROM and its error detection code (EDC) and error correction coding (ECC) to meet the demands of data storage and retrieval, whereas the red book covers CD-digital audio recording standards, and the green book covers CD-I formats. There is overlap between yellow and green books. The other prominent groups working on the formulation of these standards are High Sierra Group, Optical Disc Forum, UK, National Institute of Standards Organisation (NISO), USA and Information Industry Association (IIA), USA.

## 9. CD-ROM AT DESIDOC

DESIDOC has acquired a Philips CM 110/30 system and installed it at a cost of $1390. Whitakers Books in Print 1988 database and Grolier Academic Encyclopaedia 1989 are used in day-to-day operations in the library. NTIS and LISA databases 1989 too have been acquired; these databases are updated quarterly and semi-annually. DESIDOC proposes to acquire the databases like Applied Science and Technology Index, Reader's Guide to Periodical Literature, and McGraw-Hill Encyclopaedia for the year 1989. The databases acquired are used for ready reference/literature searches by the scientific community. The library has selected mainly those databases on CD-ROM which can be retained permanently and a few of the important databases which are to be subscribed annually. Most of the database publishers insist on return of the old discs after the updated disc has been received. In case the user fails to renew his subscription, he has to return the disc as per the agreement. So, it seems that most of the librarians/information scientists, especially in India, are reluctant to get these systems because of restrictions like this. There is a need for library associations to approach collectively the publishers for redressal of various problems faced by them. In the western countries, alternative arrangements are available, whereby these systems and databases can be installed on annual rental basis, whereas in India such facilities are not available.

## 10. NETWORKING

Earlier, sharing the CD-ROM drive was not possible, but of late research has been undertaken and partial success has been achieved in this direction on experimental basis. Now it is time for getting multi-user and/or networked environment systems. Micro Medex has succeeded in the experimental stage and has announced a next generation system in the form of a multi-user, dial-up system, which will be attached to a variety of hosts i.e., main frame computer systems. Meridian Data Inc. has CD-Net and CD-Server systems that make CD-ROM drives available as network resources. Spectrum Interactive has announced a multi-user local area network (LAN) system which is in use for the SABRE Travel Network (USA) and can support up to 14,000 locations and 60,000 terminals.

## 11. FUTURE TRENDS

Optical disc technology is having considerable impact on the working of offices, factories and homes, especially in libraries, because of its vast storage capacity in small area and fast retrieval of data made possible. Now new formats like compact disc-interactive (CD-I), compact disc-video (CD-V) and compact disc-interactive video (CD-IV) have come out from the CD-ROM. On the other side, WORM type discs have also come in. Hypertext systems are another type, which feature machine-supported links - both within and between documents - that open up exciting new avenues for information retrieval. Hypermedia is the extension of hypertext, in which the networked elements can be text, graphics, speech, audio recordings and pictures. Optical discs are hypermedia.

An erasable optical disc named magneto-optic disc is the latest form of this family which can store 6000 MB of data on a thin film of a magnetic material. 3M company had developed these erasable optical discs in 1988 and prototype discs are available at a few places. Further research is going on to store more information, say 6000 to 7000 MB, on a 5 1/4" disk. On the other hand, direct over-write technology, which is still in experimental stage, is likely to eliminate the double throughput in magneto-optic two step erase-and-rerecord cycle, and disc drives.

## 12. APPLICATIONS OF CD-ROMs IN LIBRARY AND INFORMATION SERVICES

Introduction of CD-ROM in libraries and information centres has ushered in a new 'optical information systems' era. Most of the libraries in advanced countries have already acquired these systems and are providing instantaneous information services to the readers. CD-ROM has solved major problems of these libraries in many ways by making easy access to information at a low cost, storing of information and use of the limited miniaturised form resources by many users at the same time through local area networks. There are only two unsolved issues which restrict the widespread acceptance of CD-ROM: copyright and standardization. Technology only will eventually resolve these two issues in due course of time.

If we classify all the formats of CDs from the point of view of their use in library and information services (LIS), these may be categorised as follows:

- tools for library automation like books/serials cataloguing, public access catalogues, etc.,
- books/serials selection tools,
- reference tools, and
- databases available in online format.

The various tools in CD-ROM format are given in Appendix A under four categories mentioned above.

## 13. CONCLUSION

If CD-ROM is the best information retrieval device/medium, then erasable CD will be the best storage device. The fact is that the CD-ROM technology will not replace the existing technologies like paper media, microforms, magnetic and online media; rather it will supplement them. When advantages like space saving, and faster and random access to information are considered the use of CD-ROMs will not be costly for libraries. As the CD-ROM technology is still in its developmental stage, one has to wait till the technology is available at low cost to even small libraries/information centres, as happened with computers a few years back. If the Indian suppliers are able to supply these machines on rental basis without much problems it will be of great help to the small libraries, which are unable to buy new systems.

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## I. TOOLS FOR LIBRARY AUTOMATION ACTIVITIES

### (i) Cataloguing

(a) Biblio File's Catalogue: Catalogue Production Module (CPM) is the first bibliographic CD-ROM database, in which all the three million MARC records of Library of Congress, are recorded on four discs. One can search these databases by author, title, ISBN, ISSN, LC Card No., year and place of publication and type of material. Library Corporation that developed this system is providing the CD-ROM drive and support kit (i.e. interfaces and cables to be used for IBM PC/XT/AT and compatibles) for $2930.

(b) Ingram Book Company: Laser search is another IBM PC/CD-ROM information resource system for LIS. It incorporates a fully integrated acquisitions management program that creates, orders and maintains their fund accounting records.

(c) Horizon Information Services (HIS): Cataloguer's tool kit is a system developed by HIS which includes MARC-ENGLISH, MARC-STM (English cataloguing information for scientific, technical and medical libraries) and MARC-LAW (English language legal records). It produces catalogue cards, book lables, general orders, and does original cataloguing and can be linked to other local, online or circulation systems.

(d) General Research Corporation (GRC): Laser Quest, an IBM PC/CD-ROM system, is meant mainly for retrospective and new library cataloguing functions. It provides access to the GRCCOM Resource database, which con-

tians 4 million MARC records, including English and foreign titles for books, serials, audio-visual materials, maps, manuscripts and archival materials.

(e) Carroliton Press, Inc: A subsidiary of International Thompson Information/UTLAS, this company has developed a CD-ROM-based information service called MARVLS, which uses video discs to store information. MARVLS contains complete shelf list of the LC. This company has also developed three more systems called DISCON, DISCAT and LAWMARC.

(f) Gaylord Brothers, Inc: MINIMARC is a video disc system which can support up to four standard video disc players and provide access to over 3.5 billion characters of online data. It requires two laser discs simultaneously to have complete database with indexes.

(g) Library Systems and Services, Inc. (LSSI): It is also a PC/MARC system which is in LC classification available in machine-readable form. It includes all MARC formats, including serials, maps, and manuscripts. It can be accessed through windowing features.

**(ii) Serial Control**

Faxon Company: Micro Linx, a microcomputer-based CD-ROM system for serial control, has been developed by Faxon Company. It can store complete records of the entire LC MARC-S serials for identification of title, keywords, etc. Author search can be conducted. The best feature of this system is that any record can be downloaded into user's own databases and can be edited according to the user's requirement.

**(iii) Public Access Catalogues**

Many libraries have started or completed the accumulation of their databases for the purpose of resource sharing. Some of them have produced new laser-based 'Public Access Catalogues (PAC).'

(a) Brodart produced the first PAC called Le Pac (Local Public Access Catalogue) on CD-ROM and started marketing it in July 1985. The system can store one million MARC records with their indexes on a single CD-ROM disc.

(b) Marcive, Inc. has been the first company to use WORM discs for distributing their PAC. It allows continuous updating of the discs containing bibliographic records. Marcive/PAC holds 100 MB of user data and has a total capacity of 115 MB, i.e. almost one-sixth of that of a CD-ROM disc. It can be used as union catalogue.

(c) The Ramapo Catskill Library System has developed and installed a video disc-based union cataloguing system, which contains about six lakh records.

## II. BOOKS/SERIALS ACQUISITION TOOLS ON CD-ROM

CD-ROM technology provides a convenient way to store and distribute large amount of information. So, now-a-days a lot of dictionaries, encyclopaedias, directories, catalogues, etc. are available in CD-ROM form.

(a) R R Bowker has published its entire Books In Print (BIP) series on one 12

cm CD as Books In Print. Thus, the system comprises books in print, subject guide to BIP, BIP supplement, forthcoming books and subject guide to forthcoming books.

(b) Whitaker has also started publishing the British Books In Print on CD-ROM disc and updates it quarterly.

(c) The Library Corporation has started its Any-Book on CD-ROM disc. The disc contains an automated acquisition system that automatically converts the data into a purchase order format for printing or for sending to the vendor in addition to Any-Book database.

(d) R R Bowker publishes its Ulrich International Periodical Directory (UIPD) on CD-ROM as Ulrich Plus, which covers 68,000 periodicals in 534 subject areas. It contains 35,000 additional titles from irregular serials and annuals and Bowkers international serial database update in addition to the UIPD.

(e) EBSCO has started producing 'The Serial Directory: An International Reference Book' on CD-ROM, which contains 1,13,000 international serial publications and a 'Ceased Title' index.

(f) ISI has also brought out its Science Citation Index on CD-ROM.

(g) Wilson company has brought out its Indexing Periodicals, Applied Science and Technology Index and Readers Guide to Periodical Literature on CD-ROM.

(h) INSPEC has started a joint venture called 'IEEE/IEE Publications Ondisc' (IPO, containing the full text of the IEE/IEEE Journals and Conference Proceedings.

## III. REFERENCE TOOLS/SERVICES ON CD-ROM

**(a) Grolier's Academic American Encyclopaedia on CD-ROM:** The entire 21 volume Academic American Encyclopedia (AAE) is now available on a single CD-ROM disc for $199. The encyclopaedia occupies 100 MB including an electronic index, where groups of words, keywords, concepts in context and article titles are listed, and each search can be conducted in less than five seconds.

**(b) Mapping Services**

i) *DeLORME* mapping system has started a new mapping service which can scan and store colour maps on a CD-ROM disc. It is the first digital world atlas on compact disc. These maps are stored in a compressed digital video format. The user can view many maps, separately or with vector data superimposed over each source. It is useful in the field of navigation, command and control, engineering/surveying, and fleet management.

ii) *GEOVISION* is another geographic database useful for land developers, social organisations, municipal and public departments. It uses GEODESK workstation for reading the disc.

## IV. DATABASES

A number of major online database publishers have announced CD-ROM versions of online databases in various fields like engineering, science, medicine, library & information science, finance and geography. The major online database vendors like DIALOG Information Services, Inc. and BRS Information Technologies have also developed their databases on CD-ROM.

(a) TMS and UMI (University Microfilms, Inc) have jointly developed a system called Information Delivery Module (IDM) which stores and retrieves IEEE Journals as facsimile page images. The system can display text images of IEEE journals with high resolution; it also has the capacity to zoom-in the drawings and diagrams in these journals.

(b) Engineering Information, Inc. has started publishing its Computerised Engineering Index (COMPENDIX) on CD-ROM in the fields of electrical and computer engineering, chemical engineering and aerospace engineering. This disc covers the abstracts from July 1983 and is published quarterly.

(c) Chemical Abstracts Service (CAS) is publishing its abstracts as a quarterly; the abstracts are which were drawn from 12,000 journals on a CD-ROM disc in the field of health and safety in chemistry.

(d) Royal Society of Chemistry started its Current Biotechnology Abstracts on CD-ROM disc in 1983.

(e) National Technical Information Service (NTIS) has started publishing its bibliographic database of abstracts on CD-ROM in the fields of i) aeronautics, aerospace and astronomy ii) computers, communications and electronics, iii) energy and natural resources, and iv) environmental health and safety.

(f) Cambridge Scientific Abstracts (CSA) has started publishing the full year abstracts in Aquatic sciences and Fisheries (ASFA) on a single compact disc under the name COMPACT CAMBRIDGE. It holds the information from around 2,75,000 typed pages text which is updated quarterly.

(g) Silver Platter Information, Inc. is one of the leading CD-ROM distributers/publishers dealing with above databases in various fields.

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**Knowledge is proud that he has learned so much; wisdom is humble that he knows no more.**

*— William Cowper*

**Books are good enough in their one way but they are a mighty bloodless substitute for life.**

*— RL Stevenson*

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