

LIBRARY DATABASES: DEVELOPMENT AND MANAGEMENT

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Definition, importance, advantages and disadvantages of the database approach have been discussed. There are four main sources – Shelf List, Books and other Reading material, Data Sheets and international utilities such as OCLC - for retroconversion of library's card catalogue and union catalogue of journals. The librarian can use any one or a combination of them for data entry. Librarian has to decide the priority as to which part of library collection should be computerized first. Data entry can be done in-house or it can be outsourced. After weighing the economics and other pros and cons, the librarian can decide the mode of entry. The author of this paper found in-house data entry fastest, reliable and cheapest. Having created the database, its management is also essential. There is, therefore, a need for Database Administrator in each library.

INTRODUCTION

Data in an organization, be it a corporate house or a library or government department, is regarded as a basic resource needed for its professional management. It exists in the libraries in its various Divisions - Acquisition Division, Serials Division, Technical Division, Readers Services Division, etc. - in various forms such as card catalogue, shelf list, kardex, record of charged books, record of library members, record of ordered books, record of books received against order, and so on. This data is used and processed manually by the library staff. Its processing involves a lot of repetition. For example, some bibliographic information such as author, title, edition, publisher, etc. is essential for placing orders of books. For this purpose, Book Order Slips are prepared and filed in Book Order Tray. After the receipt and processing of books in Acquisition Division, they are passed on to the Technical Division for cataloguing, classification, etc., where again the staff prepares Master Catalogue Cards containing same bibliographic

information as recorded by the Acquisition Staff on Book Order Slips with some more additions. This amounts to duplication of labour, and results in avoidable wastage of man, material and money. This wastage and reprocessing of data can be avoided in the computerized data processing approach, leading to minimization of effort. The bibliographic information entered by Acquisition Staff in the computer can be transferred to the Technical Section, where it can be used as such or corrected and supplemented, if need be, by the Technical Staff.

DATA AND INFORMATION

Data is the plural form of datum, but some people prefer to use it in singular form. It may be defined as "a known fact/assumption which forms the basis for an inference or conclusion [1]." Data is raw in nature, and consists of symbols, numbers, alphabets, strings of numbers and alphabets, etc. which represent certain things, ideas or values and convey information in particular contexts. It has to be processed or analyzed to make it meaningful. A message available to an individual remains data unless it is evaluated in a specific situation. If the recipient of message uses it for making some decision, he is said to be translating data into information. For instance, the number "60" is data, but it has no meaning unless it is used or analysed in some context such as distance or age or weight, etc. to make a decision. Similarly the statement: '60 users visited the library on 20.8.2003' is a string of textual and digital data. This statement will continue to remain data unless it is evaluated and used to answer the question: 'how many users visited the library on 20.8.2003'. Thus data culminates

into information when it is analysed and used to make a decision or draw an inference.

DATABASE

Data is organized into 'data fields'. A 'data field' is a component of a record corresponding to an attribute. One record may have several data fields. For example, a record of a book has several fields such as 'Field for Author', 'Field for Title', 'Field for Edition Statement', 'Field for Publisher', 'Field for Place of Publication', 'Field for Year of Publication', and so on. These fields taken together make a record. Collection of related records, all conforming to the same type and format, form a data file. For example, a file on 'Bibliography of Allelopathy', contains records of reading material on this subject. All the records in this file have a common subject, and are interrelated. Each record contains such information as author, title, place of publication, publishers, year of publication, edition, pages, etc. This file is given a name for its storage and retrieval. A collection of such interrelated records, with a given structure for acceptance, storage, and retrieval and dissemination of data, on demand, for multiple users for one or more applications produces a database.

DATABASE MANAGEMENT SYSTEM (DBMS)

Management of data for decision making is not a new concept. This process has been going on, in one or the other way, since long time. Libraries, ever since they came into existence in their present form, have been dealing with data management manually. The resources of the library are exposed to the library users through library catalogue – an aggregate of catalogue cards containing data of reading material on it in typed or printed form. The information about journals is maintained in Kardex form. These are nothing but examples of manual database management. The modern libraries have now applied computing power for management of these records. Thus Database Management Systems have evolved a great deal from manual to computerized systems over the last 40 years. It is the computer-based system that came to be known as DBMS. These systems are used for defining, creating,

manipulating, controlling, managing and using databases. Presently there are hundreds of DBMSs. dBase, Foxbase, Sybase, Informix, Delphi, etc. are the well known examples of general DBMSs, while LibSys, Alice and SOUL are the examples of library-oriented DBMSs.

ADVANTAGES OF DATABASE MANAGEMENT

Man, saddled with a fertile brain, is always in search of better alternatives. If the new alternative is found to be more economic and efficient than the existing one, he would switch over to the former. Same holds true of the modern DBMSs which have a number of advantages as discussed below:

Economy

In general, economy refers to the fact that the collective cost of several combined operations shall be less than the sum of the costs of the individual operations. Database approach culminates into centralization of applications, which leads to concentration of larger, costly and more powerful computers, and technical expertise in one location. This usually results in an economy of scale. Further, since many users share the same database, any improvement in the database will potentially benefit all of them. If there are two sets of systems for library automation – one consisting of integrated, and the other consisting of independent modules for acquisition, cataloguing, circulation and serials management work, the integrated system will definitely be more economic than the other.

Greater amount of information from the same amount of data

Transformation of data into information is the primary goal of a computer system. Even if, all the data, that a user requires for producing a report, is available in the computer files, yet he would not have access to it easily, and thus would not be able to obtain the desired information for the report. Assume that the bibliographic details of books available in a library are available in a file in a file-oriented

system. The data available in this file cannot be used for producing a list of books on a subject. If, however, the same data were available in a well-designed database, it can be used to have a list of books according to title or subject or class number. Thus, the same data can be used for producing several types of reports.

Sharing of data

In a database approach, same data can be shared by several authorized users. For example, holdings of a library, stored in a computerized database management system, can be used by the library users for searching of books by subject or author or title or class number from any node through OPAC; for check out and check in of books by the Circulation staff; for duplicate checking by the Acquisition staff, and so on. Similarly online catalogues can be shared by libraries amongst themselves, and any change therein would be flashed to all the users automatically. In addition, new applications can be developed using the existing data in the database without the added burden of creating separate files.

Balancing conflicting requirements

Database approach maintains the balance between the conflicting requirements of different users of data. Keeping the overall interests of the organization in mind, the Database Administrator - an expert or a group of experts, within the organization, to manage the database - ensures that the database serves the purpose of the entire organization, and not just a single user or a group of users. While an individual user group might be served less potentially in a database approach than it might have been if it had its own isolated system, the overall organization will definitely be benefitted. If the organization benefits, so do the individual user groups. Thus database approach takes care of the requirements of the individual users as well as the organization as a whole.

Enforcement of standards

Central control of data ensures the enforcement of standards. There are several formats for

exchange of information at international level. MARC format and Common Communication Format (CCF) are the most important ones. Some library DBMSs might follow MARC, while others CCF. Whatever standard is adopted by the library, its meticulous implementation is ensured in the database approach. Similarly there are different cataloguing codes such as Anglo-American Cataloguing Rules and Classified Catalogue Code in use in libraries. An inbuilt arrangement is made in the library DBMS to follow the code for display of the record. The user of DBMS need not worry to keep the rules in mind while producing a list of documents according to AACR or CCC format. The reins for implementation of the code are taken over by the DBMS.

Control over redundancy

Every library requires information of the Publishers for use in Acquisition, Technical, and Periodicals Sections. In a file-oriented system, this information will have to be stored in the three Sections separately. But the storage of same data in one file in a DBMS will meet the requirements of all the three user Sections. Thus redundancy of maintaining multiple copies of the same data can be minimized. In practice, however, there might be places where we might have to introduce some limited amount of redundancy into the database for performance reasons. But even in these cases, we are able to keep it under tight control. This is why we say that redundancy is minimized rather than eliminated.

Consistency

Consistency emanates from the control of redundancy and enforcement of standards. Let us assume that the author of a book is a corporate body. Its name is rendered according to some cataloguing rules, say AACR II. In a database approach, if this name occurs at one place, there will be no scope for change in the style of its rendering in case of other documents authored by the same corporate body. But if it occurs in different files, there are chances that its name is rendered in different styles in

different files. Same applies to the names of publishers. Thus database approach ensures consistency.

Data Integrity

Data in the database must follow the rule of integrity constraint. Data integrity implies that the data should be accurate, relevant, complete, and easily and timely accessible for the uses it is intended for. For example, database of books of a library should contain data of entire book collection, it should be complete in respect of bibliographical details of each book, it should be relevant to the purpose for which it has been created, and it should be easily accessible and retrievable whenever required. If the library database indicates the availability of a book in its collection, which is actually not present; or if the author of a book is not correct, then the integrity of the database can be deemed to be doubtful. Database approach helps to ensure the integrity of the database because of its very structure.

Data Security

Security of data is the main concern of every organization. Security measure is a check against the unauthorized users and hackers, who may destroy the valuable data. Data security is achieved through the scheme of passwords. Since Database Administrator (DBA) has control over the operational data, he can define authorization procedures to ensure that only legitimate users have access to the data. DBA can further allow different users to have different types of access to the same data. For example, the staff of Technical Section may be authorized to enter and/or change the data in the Library Catalogue, while the library users may be allowed only to access the data but not to enter or change it. Such a provision for security of data is possible in the DBMS.

Flexibility and responsiveness

In a file-oriented system, data maintained in different files by different users is not flexible and responsive. Assume that a list of books is arranged in an alphabetical order by author in

a file in the file-oriented system. The system will not respond to queries for displaying this list in different orders such as alphabetical order by title or subject or publisher or date. If the same data is available in a structured database, it will be possible to get response from the same database by a user in all the different ways stated earlier. Further, the flexibility furnished by the DBMS aids the programmers to develop new programmes to satisfy specific user requests.

Enhanced productivity of the Programmer

There is a facility in almost all the DBMSs for writing applications. The programmer can employ this facility to write applications to meet local requirements. Writing a file-oriented application is a more complex job in comparison to writing a similar application using DBMS facility, because the programmer does not have to worry about the mundane data manipulation activities. So, he will be more productive. Studies have shown that on the average, he will be two to four times more productive i.e. a new application can be developed in one-quarter to one-half of the time it would take if it were a straight file-oriented application. In addition, with the advent of fourth-generation languages built around database management systems, the productivity increase can be much more dramatic. Ten to twenty-fold increase in productivity is not a matter of surprise.

Easiness in maintenance of programme

A DBMS is a collection of thousands of interlinked small programmes. When interacting with a DBMS, programmes, though interlinked, are relatively independent of the actual data in the database. This means that any change to the structure of the data itself may not require maintenance of the existing application programmes. But this is not true in a straight file-oriented environment. Even a simple change to file layouts can force substantial changes in every programme that accesses the file. In addition, since the low-level data manipulation is handled by the DBMS, details concerning this manipulation do not appear in programmes. Thus, programme maintenance

becomes relatively easier in a database environment.

Data independence

While easiness in programme maintenance is an important advantage of database approach, having programmes independent of the structure of the database has other advantages as well. Without data independence, it would be difficult to change the database structure to improve performance and meet the changing requirements of the organization. No sooner the database structure is modified in a file-oriented system, all or some programmes in the system will have to be changed. This fact would act as a strong incentive not to make any change. Fortunately, data independence helps remove this obstacle i.e. the obstacle to change the structure.

DISADVANTAGES OF DATABASE MANAGEMENT

The dictum: *there is a counter reaction to every action*, holds true in database approach also. If there are advantages of database approach, there are disadvantages as well. Some of the perceptible disadvantages - size, complexity, cost, additional hardware requirements and difficult recovery - are discussed below:

Size

In order to support all the complex applications that it must offer to the users, a DBMS has to be a large programme, occupying several megabytes of disk space as well as substantial amount of internal memory. For example MS-WORD is a simpler programme as compared to dBase or Sybase or Informix, and the former occupies less hard disc space in comparison to the latter. Size of the programme increases with its complexity.

Complexity

Complexity and breadth of the applications presented by a DBMS make it a complex product. Programmers and analysts must understand the features of the system well in order to make full exploitation of its power. In

addition, with many choices to make while designing and implementing a new application using a DBMS, there are possibilities of making incorrect choices, especially if the understanding of DBMS is not thorough enough. And a few incorrect choices can spell disaster for the whole project.

Cost

A good DBMS is an expensive product. By the time all the appropriate components related to DBMS are purchased for a major mainframe system, the total cost may run into millions of rupees.

Additional hardware requirements

Because of the size and complexity of the DBMS, greater hardware resources would be required which would not be necessary otherwise. This means that if the hardware resources are not upgraded when a DBMS is purchased, users of the system may very well notice a severe degradation in performance. Purchase of additional hardware resources would further add to the cost.

Greater adverse impact of hardware/software failure

In the database approach, many of the data processing resources are concentrated in the database. Failure of any component of hardware/software would have far-reaching consequences than in a non-database environment. All the nodes will go down in database environment, while only one node will stop working in a file-oriented system.

Data recovery more difficult

Due to complex nature of DBMS, the recovery of data in the event of a disaster is far more difficult and complicated than a file-oriented environment.

LIBRARY DATABASES

Acquisition of books, subscription of journals, reference and information services, circulation of reading material, and accounting and management are the major functions of a library.

Accounting and management functions except management of budget for books and journals do not normally form an integral part of a library-oriented system. However, the following databases are created in libraries:

- i. Acquisition Database
- ii. Online Catalogue
- iii. Serials Database
- iv. Circulation Database
- v. In-house Bibliographical Databases

Each of these databases may have several sub-databases. Circulation Database will consist of Database of Checked Out Books, Database of Library Members, etc; Acquisition Database will consist of Database of Ordered Books. Database of Publishers, etc.; Serials Database will consist of Database of Current Serials, Union Catalogue of Serials; and so on.

SOURCES FOR LIBRARY DATABASE DEVELOPMENT

The computing technology found libraries and information centres as one of the most potential areas for application ever since its advent in 1960's. Most of the libraries and the information centres in the developed countries are already automated. Introduction of this technology in libraries in the developing countries has also assumed high priority during the last few years. Automation of library activities involves application of computers to routine jobs, retroconversion of library catalogue, construction of online union catalogue of journals, construction of in-house bibliographical databases, sharing of resources, etc. Automation of routine jobs of all types of libraries, and all operations of a new library or a library with a small collection is not a difficult task. But retroconversion of library catalogue and construction of online union catalogue of libraries with large collection of books and back file of journals are strenuous and arduous missions. Five main sources – Shelf List cards, documents themselves, Data Sheets, international utilities and Kardex/Shelf List of

journals - are at the disposal of the librarians for achievement of these missions.

Shelf List of Journals/Kardex

When we talk of library automation, we usually talk of and devote much of our energy for conversion of Card Catalogue into Online Catalogue and construction of Union Catalogue of journals. Almost all the libraries have Shelf Lists of books, and Kardex/Shelf List of journals' holdings. There is no denying the fact that the Shelf List cards/Kardex in Indian libraries do not have complete bibliographic information about the information resources. But they definitely contain such important elements of bibliographic information as author, title, edition, imprint, pages, call no. and accession no. in case of books; and title of journal, publisher, periodicity, volumes and issues available in library, class no., etc. in case of journals. This minimum information, if entered in the computer, will automate the library at least partially. These partially automated catalogues will offer faster and more comprehensive access to the library resources than the manual systems. The remaining bibliographic details such as parallel title, co-authors, collaborators, key terms/subject headings, ISBN, price, series, editor of series, etc. can be entered in second phase. This is the fastest method of retroconversion of the Card Catalogue and Union Catalogue.

Books, Journals and other Reading Material

Ideally books and other reading material should be used as a source for entry of data directly into the computer, but the data entry operator shall have to be both a qualified librarian as well as a professional data entry operator. Such a combination is rarely found except in case of in-house keying in. This process is highly labour intensive and costly, and will take years for complete data conversion.

Data Sheets

Data sheet containing full bibliographic information is also an ideal source for conversion of card catalogue into online catalogue and construction of online union catalogue of journals. In this process, the

librarian designs a data sheet for recording of bibliographic details of a book and other reading material. Either the library staff or the professionally qualified hired manpower will fill up the data sheets from the books and other reading material. Data entry will be done from the data sheets. Filling of data sheets and subsequent data entry from the data sheets into the computer are time consuming and costly processes.

International utilities

This method is applicable to data entry of books only. OCLC databases contain bibliographic details in MARC format of almost all the books published in English language in all subjects all over the world. Chances of finding bibliographic details of books and other reading material in English language, stocked in Indian libraries, in OCLC databases can be rated as high as 90 per cent. So Indian libraries can use OCLC databases to automate their catalogues. The librarian shall require a licence from OCLC management for accessing their database and downloading the bibliographic details of the books. In the Indian scenario, it is a costly matter for reasons of licence fee and telecommunication/internet connectivity.

PRIORITIES FOR LIBRARY DATABASE DEVELOPMENT

The librarian should decide as to which library activity he would like to automate as a first priority. Obviously his decision would go in favour of such day-to-day routine jobs as acquisition, cataloguing of current additions and subscription of current journals, followed by retroconversion of card catalogue and back file holdings of journals. He has to take separate decisions for both the retroconversion processes. Two options - data entry from head to tail, and automation of current additions and live collection - are open to him for retroconversion of card catalogue.

Data entry from head to tail

Reading material in all the big libraries is organized in several sequences depending

upon its nature. Some reading material may form part of general collection, some is placed in reference collection, some is kept in closed sequence, and some is organized in textbook section, and so on. Having decided the source for database development, the librarian decides which of the collections should be taken up for data entry as a first priority. Having decided the collection, data entry can be started from the head of that collection and continued till tail is reached i.e. start data entry from class number '000' (DC number) of the selected collection and continue up to class number '999'. The first priority collection is followed by second priority collection, and so on.

Automation of current additions and live collection

Each library has some dormant and some live collection. Reading material in less use forms part of dormant collection, while, to the contrary, reading material in frequent use forms part of live collection. Current additions also form part of live collection. Some librarians advocate the computerization of current additions and live collection as a first priority. They base their argument on the premise that majority of the information requirements of library users can be met from this collection. In this process, besides current additions, books borrowed by the users are picked up for data entry. As soon as these books are returned, the circulation staff sends them to the computer section for data entry before transporting them back to the stacks for circulation. Dormant collection can be taken up in the second phase.

DATA ENTRY FOR RETROCONVERSION

There are two ways of data entry for retroconversion - outsourcing and in-house data entry. Under outsourcing, either a professional agency can be hired or professional data entry operators can be engaged for data entry of reading material in the libraries. Each mode has its own advantages and disadvantages.

a. Data Entry by Professional Agency*Advantages*

- i. It is faster than the other modes.
- ii. Library staff shall be free for other jobs.
- iii. Agency will be responsible for integrity of data.

Disadvantages

- i. It is very costly.
- ii. The agency will ask for data on sheets which the library will have to prepare with the help of existing staff, or else some other professionally qualified people will have to be hired. On the contrary, if the librarian decides to use shelf list for data entry, this disadvantage will not be there.
- iii. The agency will have to be provided a copy of the software for data entry if they decide for data entry at their own site or else some conversion programme might be required.
- iv. If the agency is asked for data entry in the library, then they might ask for PCs and other facilities such as accommodation, etc.
- v. If any data problem comes to notice at a later stage, it will be difficult to catch hold of the agency.

b. Data Entry by Professional Data Entry Operators*Advantages*

- i. It will be less costly than (a).
- ii. It will be as fast as (a)
- iii. Librarian will have direct control over the operators.

Disadvantages

- i. The operators can key in data from the data sheets prepared either by the library staff or some other staff engaged for this purpose.
- ii. Lot of time of the library staff will be wasted in filling data in data sheets. If the librarian decides to use shelf list for data entry, then this disadvantage will not be there.

- iii. Librarian and other senior staff will have to devote a lot of time to supervise their work.
- iv. It will be costlier than in-house keying in.
- v. If any data problem comes to notice at a later stage, it will be difficult to catch hold of the operators.

c. In-house data entry*Advantages*

- i. Library staff to be deputed for data entry is more competent for this job because of their long working experience, and professional qualifications which they possess.
- ii. They can key in the data directly from the book or shelf list cards. So, filling of data in data sheets can be avoided.
- iii. The time and money which the library will have to devote on preparation of data sheets will be saved.
- iv. Library staff will be deputed for this job after duty hours, and will be paid honorarium in lieu thereof. The amount of honorarium will certainly be less than the charges of the professional agency/data entry operators. Hence this alternative will be far cheaper.
- v. This alternative is more economic due to (ii), (iii) and (iv) above.
- vi. Library work will not suffer on account of (iv) above.
- vii. Data security will be far greater than the other modes.
- viii. During the process of data entry, the library staff will get training and gain confidence in handling the software. This is the most outstanding advantage.

Disadvantages

- i. It will be slower than the other modes.
- ii. The librarian and other senior staff will have to devote lot of time on supervision and organization of work.

DATABASE MANAGEMENT

Database management is a very important function in the library. If the library databases are not properly handled and maintained, the library services will go haywire.

Database Administrator (DBA)

Database management is a vital data resource management function. It dwells upon the establishment and enforcement of policies and procedures for management of data as a strategic resource of the library. This amounts to collection, storage, and dissemination of all types of data in such a manner that the data becomes a standardized resource available to all end users. Data management involves the definition, creation, control, use, maintenance, preservation and disposal of database in support of library's functions and objectives. These functions demand the presence of a professionally competent Database Administrator (DBA) in the library. DBA is professionally competent if he possesses degrees in computer applications. Training in librarianship will add to his competence and productivity.

Definition, creation, redefinition and disposal of the data

Design of logical structure is the first step in the database definition process. The process of database structure design essentially consists of identification and naming of structural elements of data, grouping of data items and relating the groups. The DBA solicits the advice of users to define the meaning of the data, seeks their agreement so as to resolve any conflicts which may arise and establish certain standards and procedures which must be adhered to in the design process. Having defined the data, the DBA establishes mechanism to capture and store new data in the system leading to creation of database. This step is accompanied by editing and validation of the incoming data. The DBA must also pay attention to the redefinition of data structure. He should redefine the data structure, if need be. Implementation of management policies

regarding data retention and disposal is another important responsibility of the DBA. The value of data diminishes with the passage of time. It is, therefore, desirable to aggregate older data, store it in offline archival files, and eventually dispose them of, if they are not needed any more. Library-oriented softwares are available in the market. So there will no need for developing a software from scratch, but DBA has to be there for its implementation and maintenance.

Use of database

Promotion of use of the database within the organization is the duty of the DBA. In order to achieve this objective, he must educate, train and advise the library staff in the use of the system. He must provide formal as well informal training to the library users in the use of OPAC and other tools such as sending online request for reservation of books, submitting online requisition for purchase of reading material, etc. Users' manual on the use of facilities and languages of the database management tools must be made available to the library staff and the end users if the need arises. Library staff and other users might need guidance of the DBA in the use of these manuals.

Maintenance of database

Maintenance places a very special responsibility on the DBA. Archiving is essential for restoration of data in case of a disaster. It demands control over physical existence, well-being, quality, updation and concurrency of the database. The DBA should try to update the database every day in such a manner that the work of the library is not disturbed. He can update the database either in the morning or in the evening before or after working hours. Obsolete should be deleted and less required data should be archived on tapes. Temporary files, generated during use of the database, should be deleted regularly to keep the disc space free for other useful operations.

Database security

DBA must ensure the security of database against attack and misuse by the cyber

criminals. For this purpose, he will have to employ latest technologies such as firewalls for filtration of incoming and outgoing data by e-mail. Standalone anti-virus system for standalone environment, and network anti-virus system for network environment are essential technologies which should be used for database security. Arrangements for recovery of database, if lost or destroyed accidentally or otherwise, must also be made. Use of back up technologies for taking back ups of the database from time to time is an essential measure for database preservation and recovery. More than one copy of the back up should be maintained. The DBA should use password system to provide authorizations to the users to ensure protection of the data. Authorizations should be regularly monitored.

Monitoring operations and performance of database

The DBA is generally responsible for data-related aspects of operations. He must ensure that the database remains in operation all the time. For this purpose, he will have to purchase UPSs for constant power supply, and make sure that the server works uninterruptedly. He should maintain control over all the operations related to it, and strive to obtain maximum efficiency from the database. A recorded history of data-related events should be kept. This will help the DBA to solve problems of similar type in future.

CONCLUSION

Data has always been an important resource in all the organizations, but it has assumed strategic importance in this competitive age. There is no denying the fact that its power must be exploited to the benefit of the organization. This goal can be achieved through database approach because of its numerous advantages over file-oriented system. Libraries are no exception to it. Shelf Lists, Kardex, Data Sheets, document themselves and international utilities such as OCLC databases can be used as sources of data for creation of databases in

libraries. Each mode has its own merits and demerits. Some Librarians may advocate the hiring of Professional Agency for retroconversion, some may argue in favour of Data Entry Operators, some may prefer data entry by their own staff, while others may like to use international utilities. During a lecture delivered to a gathering of about 20 very senior agricultural librarians at Ahmedabad on 7.8.2003 from across the country, this subject was debated. The audience were almost united in declaring that they would prefer in-house data entry provided they had sufficient staff. Since they did not have sufficient staff, they championed outsourcing of data entry. Here again they were almost evenly divided. About 40% were in favour of data entry by a Professional Agency, while the rest were proponent of hired professionally competent Data Entry Operators. The second mode (data entry by Data Entry Operators) at LBS National Academy of Administration, Mussoorie in 1991, and third mode (in-house data entry) at CCS Haryana Agricultural University, Hisar a year and half back has already been tested. Shelf List cards were used for data entry. Priority of collections for data entry was decided. Data entry was started from class number '000' in each sequence and finished before embarking on to the next sequence. On the basis of experience, it can be concluded that in-house data entry is far more economical and advantageous than other modes, particularly in developing confidence in the staff which they would not get even after formal training.

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