0 INTRODUCTION

Information is now recognized as the fourth essential resource in addition to the usual three namely land, labour and capital for making an enterprise a success. whereas usually more than what is needed of a resource is considered desirable, as regards information an amount less than or even more than the necessary amount is a disadvantage. Instantaneous access, currency, accuracy and desired format are key to successful information management. It is now well established that computers can convert the mass of data in an organization to an information resource.

1 BIBLIOGRAPHIC VS NON-BIBLIOGRAPHIC INFORMATION

Information to a research scientist constitutes mainly published information also referred to as bibliographic information. Of late, one includes pamphlets, annual reports, reviews and patents also in the category of bibliographic information. Essential characteristic
of bibliographic information is that once generated it is referred to in its original form (with mistakes and all). One may wish to find out if a correction has been made but one can by using a document go only backwards (using the references cited) and has no clue (other than chasing the title and author names) to go forwards. Computer based systems can remedy this problem to some extent by setting up so called 'forward linkages'.

Bibliographic data is usually voluminous and one handles only reference information rather than the whole article. To that extent precision and recall are governed by the key information handled. Bibliographic information system mainly concentrates on profile matching, selection and listing rather than processing the content as such.

Non-Bibliographic information which covers the entire gamut from census data to trade information, to data in handbooks, differs mainly from bibliographic information in that one has access to entire data rather than merely the key (or reference) to it. Whereas data like that of census compare very well with bibliographic data in volume most of the special purpose non bibliographic information systems are comparatively small and are quite manageable in size. Non-bibliographic information essentially contains data or fact (in its entirety) and as such one prefers to refer to such information systems as Fact Retrieval Systems (FRS).
Whereas accuracy of information is essential for all information systems it is crucial in FRS. A minor error in a bibliographic data may be irritating but in an FRS it can be very damaging. Since facts change with time, for example the total staff strength in an organization, inaccuracy can arise because of the data being not current, that is, correct upto the minute. Thus one needs to pay attention to both accuracy (no error in handling) and currency in FRS. Further, numbers often do not mean much unless the units in which they are expressed are also known. It is useless to know that distance between two places is 27 without knowing whether it is in km or miles. Since storing units with each item of data is uneconomical one tends to avoid it, but if one is not careful data may lose its significance when one user borrows from another FRS without checking on the units.

Information Is made up of items (facts) and association with other Items. For example, 32715 and 41624 are Employee numbers and 27 and 43 are ages. Unless one knows which age goes with which employee number information is not complete. FRS has to handle both facts and association and the most common method of handling association is through physical contiguity (record).

As mentioned earlier, one rarely modifies a bibliographic pntiy since the document concerned will continue to exist in its original form. On the other hand in FRS one should continuously modify the fact as and
when it is warranted. One dreads the interval of time between physical change in fact and its reflection in the data base since during that interval FRS is actually providing wrong information. The process of changing an item in a data base is referred to as updating and one would like to accomplish it as soon as possible. For example, in an information system for airline reservation one would like a cancellation to be reflected as seat availability (especially if it was nil before) as soon as possible so that the next customer wanting that seat can be served. Urgency to update is a function of the use to which an information system is put and since the cost of instantaneous updating (on-line system) is quite high one is not prepared to incur it unless it is cost-effective and the application warrants it.

One usually needs only to list relevant references in the case of a bibliographic information system, one requires further processing of the retrieved data in the case of FRS. Processing could range from the simplest such as calculating an average (or some statistical processing) to the most complex such as analyzing using a mathematical model. Thus FRS usually incorporates selective retrieval and further processing.

In summary, non-bibliographic information differs from that of bibliographic in that it is dynamic, very sensitive to error, has more inter-item association and lastly needs further processing.
2 STEPS IN ORGANIZING AN FRS

21 Data Collection

Data tends to accumulate errors every time it is handled such as recopying, manual conversion of units, typing, punching, manual verification etc., before being entered into the computer. One cardinal rule worth following in data collection is to record data in its final form for punching at the primary source itself. It is essential to use proforma which take into consideration the level of the personnel used for recording and the environment in which they operate. One should be so fanatical about recording data at the primary source itself that one should not permit even a slip of paper being sent from the actual spot to a clerk located at a distance for recording in the proforma.

22 Control Data and Error Control

In spite of one's best efforts errors creep in. So, one uses additional mechanisms and data for checking purposes. For example, a number indicating the total number of entries will ensure that all entries are taken into the computer; gross total of all entries enables one to a certain extent, to detect error in entries. So, a good system incorporates control data to assist computerized checking. Machine based verification by an independent operator goes a long way to control errors. Manual verification is a very inexpensive way to generate very costly errors!

23 Editing

Special programs referred to as edit programs are written to use control data and other known characteristics
of data (bounds, numeric/non numeric etc), to detect cer­
tain types of errors. One should not overdo the business
of checking using control data, because when control data
exceeds a certain limit error in control data becomes a
problem!

24 Retrieval
One uses special query languages, often natural lan­
guage-like, to retrieve data. Recent trend is to use query
forms displayed on a display unit. User fills in the
questionnaire or selects (similar to menu selection from
a menu card in a restaurant).

25 Processing
User can initiate specially written programs (in
FORTRAN or similar high level language) to process the
retrieved data. One normally provides a library of fre­
quently used programs for the purpose.

26 Report Generation
Computers to-day can produce not mere tables but
textual reports with retrieved information introduced at
the right places. It is found that the key to the success
of a FRS is user oriented functional reports.

27 Security of Data
It is often necessary to control access to data particu­
larly when the data is sensitive or classified. Present,
, day software allows controlled access to data. Only
authorized users (who know a password) can see or use
Non-Bibliographic Information System

the protected data. More priviledged ones are permitted to alter it. Thus, deliberate or accidental modification is almost totally avoided.

28 Archiving

Data about an enterprise grows and sooner or later one has to decided to move some data to archives. Usually, currency of a data expires after a certain period and one has to periodically remove them from on-line storage so that the FRS runs efficiently. Even the largest computer available to-day cannot permit the luxury of keeping junk around and archiving policy should be given a great deal of attention.

3 COMPUTER CONFIGURATION NEEDED

31 Hardware

One can set up efficient FRS using mini-computers. But the on-line disk storage should be adequate (100-200 million bytes). One needs tape units to remove data for archival purposes. Enquiry is best done through an alphanumeric display unit. An on-line printer is necessary to obtain hard copies of the reports. So far one has been using cards to enter data. But the trend is towards key to diskette units which avoid use of ecologically un-wise computer cards.

32 Software

Many manufacturers provide software for file management and using one of the high level languages available on the system one can setup an FRS. Trend is towards developing special purpose software for data
base management, even for small computers.

4 COMPUTERIZED DRUG INFORMATION SYSTEM

IIT, Madras has setup a drug information system at the Madras General Hospital. Project is sponsored by the Department of Electronics. Information handled include patient data, daily drug prescription and administration, stores indents and drug purchases. System is used to monitor use of costly drugs and thereby control costs. Further, one can order optimum quantities of drugs so that loss due to expired drugs is minimized. One also hopes to evolve an optimum buying policy (among computing brand names) to make available more effective drug dosages for the available money.

Biggest problem in setting up the system has been making data collection efficient without increasing burden on the already overworked doctors. This necessitates making many administrative changes, alter so called statutory requirements, so that information flow is smooth and explication of efforts is avoided.

Lastly, success of an FRS depends entirely on a thorough understanding of the environment in which it operates and its information needs - not what the information scientist thinks the organization needs. It is necessary to make the change gradual and gain the confidence of the user. FRS is a waste of resources if the key people namely decision makers do not cooperate by using it and suggest changes to meet their needs. Computers are only secondary and user his environment and information needs are the primary factors in making an FRS worth establishing.