INFORMATION MANAGEMENT: TOOLS AND TECHNIQUES

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[Discusses the concept of Information Management and presents a list of various tools and techniques available to librarians and information professionals for information management.]

1. INTRODUCTION

The importance of information as a vital source in today’s society hardly needs emphasis as information brings people and thoughts together. It is the exchange of ideas, news and data that make a society what it is. In the post-industrial society, it has been said that what counts is not raw muscle power or energy but information, and indeed the advanced economics of the world have already become information intensive. As a matter of fact, information is now called the fourth resource, the other three being people, money and physical resources. From the economic point of view it has been recognised and realised the value is created by the interaction of these four resources. As David Best puts it “If this claim needs justification, consider the effects of lack of information on the financial markets on ‘Black Wednesday’, or the havoc caused by insider dealing when some individuals have information on adverse drug reactions not being available when need or not being managed in a way which enabled early waning to patients is another case in point. In other words, he has emphasised on the necessity of taking charge of information (i.e. information
management) in the same way that we actively manage money, people and equipment. (Best, 1996).

2. DEFINITIONAL ANALYSIS

In attempting to discuss the subject of Information Management, it would be helpful to define and delimit the use of the terms and consider some of the resulting implications. This is especially because the meaning of term depend on the context in which they are used. Therefore, for any purposeful discussion that will ensure some degree of success, defining of terms becomes desirable, if not essential.

2.1 Information

Some meaningful message recorded in conventional or non-conventional media and stored and processed by systems and services with a view to providing a more or less permanent memory of the message and their dissemination to users.

BS 3527, Part 1, 1976 defines information as “the meaning that a human assigns to data by means of conventions used in their presentation”. In other words, information is data that has given shape. It may be considered as processed data. Thus, information is data plus the meaning, which has to be a result of human action.

An unconventional definition, however, states that information is

- What we take in from outside to feed our knowledge so that we can function successfully and achieve our aims.
- What is necessary and what is available in a given situation for this purpose?
2.1.1 Information as a resource

This concept can, perhaps, be explained by quoting more or less verbatim, Forest Woody Horton's excellent definition, which says that treating information as resource means treating it as

- Something of fundamental value, like money, capital goods, labour or raw materials;
- Something with specifiable and measurable characteristics, such as method of collection, utilities and uses, a life cycle pattern with different attributes at each stage, and interchangeability with other resources;
- An input, which can be transferred into useful outputs that are beneficial to achieving the organisation's goals;
- Something that can be capitalised, depending on management's purposes;
- An expense for which standard costs can be developed and cost accounting techniques can be used to monitor and control;
- Something that presents to top management a variety of development choices, e.g. making trade-off decisions between information-intensive and manpower-intensive investment; between teleprocessing and manual processing activities; or between maintaining an information product or service in house, or buying from an external source (Horton, 1982).

2.2 Management

Management has been defined by the American Management Association as the guiding of human and physical resources into dynamic organisation units that attain their objectives to the satisfaction of those served, and with a high degree of morale and sense of attainment on the part of those rendering the service. Perhaps, a simpler definition would be "Getting results through people". Generally speaking, management would include planning,
organising, staffing, directing, coordinating, reporting and budgeting ... POSDCORB, for short. Marketing of course, forms part of managerial activities.

2.3 Information Management

While the terms 'Information' and 'Management' have been defined, there does not seem to be one view in regard to the couplet 'Information Management' both in academic and professional circles. Consequently, it has been described as chameleonic in character or nature or to be more charitable as McGee and Prusat (1996) put it Information Management (IM) is an emergent field of interest”. Whatever it is, IM is one of the buzz terms of the present age of librarianship / information science / archives and record management. It is a term that has come to significance as a consequence of the greatly increased interest in Information Technology (IT). The following are some of the definitions / explanations found in literature:

1) According to Martin White "IM is at least two thousand years old, and has been masquerading under the name 'Military Intelligence". As a working definition, she cites "The efficient and effective coordination of information from internal and external sources (Cronin 1985). She goes on to identify three components of IM:

   a) Information resources including the identification, assessment and use of both internal and external resources.
   b) Technology, covering methods of inputting, storing, retrieving and distributing information on both a local and remote basis.
   c) Management, involving strategic and business planning, human resource management, inter personal communication, accounting, budgeting and marketing.
2. Marchard notes "IM includes two dimensions:

a) Managing the information process, and
b) b) Managing the data (information) resources of the organisation.

3. According to Tom Wilson (1987), IM has no standard definition, but the basis of the idea can be found in one of Peter Drucker's works: "The systematic and purposeful acquisition of information and its systematic and purposeful application are emerging as the new foundations for work, productivity and effort throughout the world". Wilson then goes on to comment "That notion that the economics of the future world depend upon the 'purposeful acquisition' of information is at the root of the IM idea. Also at root is the idea that the systematic and purposeful application of information will depend increasingly upon the application of IT. Two ideas, therefore, come together in the concept of IM: information as an important economic resource and IT as a tool for its effective management." Wilson's contention is that IM curriculum should be composed of:

i. The idea of the emergent information society" and the need for information policies, and IT policies in societies and organisations;

ii. The notion of systems and "systems thinking and the exploration of these ideas in the design and development of computer based information systems and services;

iii. Information technology: Hardware, Software, and Telecommunications. Including such matters as the evaluation of software packages, and some exposure to computer programming;

iv. The Economics of Information: costs, value, pricing policies, information as a public good and information as a product, budgeting information systems and services;
v. The Evaluation of Information Systems and Services from the perspectives of efficiency and effectiveness;

vi. The identification of users' needs for information or as it is generally expressed in the IT management literature, "User requirements studies".

Concluding, he remarks that "The idea of IM as an integrating concept is that it will lead to the definition of a specialisation within the information professions which can be applied to any organisation, including libraries, archives, and the myriadic organisations which have needs for the organisation and handling of information".

4. The introduction to the conference proceeding "IM in engineering education (Lehigh University, USA, 1966) provides a practical and useful definition of IM. IM can be defined as that engineering sub-discipline designed to acquaint the engineering student with principles, theory and the use of information as an adjunct to his learning process and the practice of engineering. Specifically included are: the nature of engineering information, its sources, dimension, growth and scope, the manipulation of engineering information including storage, retrieval, transfer and application; available resources, including variety, number and location; methods and cost of use, the use of engineering information in directed study, free reading, problem solving and professional engineering application. The mechanisms, processes, benefits, costs, history, current use and possible future applications of IM and systems are implicit in this definition... The concept of IM is attractive because it provides a single concept in place of the several in "Information sources, Media and Systems", thereby offering simplification in thought and discussion.

5. Lynda Woodman comments that IM is all about getting the right information, in the right form, to the right person, at the right cost, at the right time, in the
right place, to take the right action". This sounds quite familiar -- a re-enunciation or implication of Ranganathan's Five Laws of Library Science.

6. Based on the Touche Ross survey (1994), Best (1996) defines IM "as the effective production, storage, retrieval and dissemination of information in any format and on any medium to support (institutional) business objectives".

From the above, one can infer that IM covers the whole spectrum of information handling activities, technology and its role in information handling as well as various management activities practised in institutions.

3. TOOLS AND TECHNIQUES FOR IM

While the need for effective IM within an institution is not new, two major trends, however, have come together to create an unprecedent awareness of the importance of information. Firstly, the growing complexity of organisational structures and operations, and secondly the impact of computing and communications technologies (collectively called IT) on work functions and patterns. Consequently, the managerial spotlight is now on information processing and information resources handling within the organisational framework (Lewis, 1985).

The question then is not what IM but How IM? The answer lies in the various tools and techniques available to the library and information profession, some of which are discussed below.

3.1 Information Technology

The field of librarianship and information science has undergone a sea change during the past three decades, due to the impact of information technology on the generation, processing, storage, retrieval and dissemination / transmission of information. At this juncture, it may be
useful to remember that the four interrelated trends of IT ... Multiple IT, Dispersing IT, Accelerating IT, and Pervasive IT have altered, for example,

- Objectives and strategies, the nature of sources and services
- Operational / organisational structures, the ways in which service(s) is delivered.

In addition, the advantages of IT which include: accommodation of increased workload, achievement of greater efficiency, ability for generation of new services, facilitating cooperation etc. can stand in good stead in the quest for quality and productivity of L & I sources (collection) and services. This newly introduced technology essentially based on electronics seems to be gradually replacing the conventional tools in information activities, as it is amenable to integration unlike the latter. In other words, IT facilities both manipulation and synthesis of information. Nevertheless, integration has not been achievable in many cases due to incompatibilities in system hardware and software design and associated standards. At this juncture, perhaps, a listing of advances / key technologies which the market has identified as the necessary foundations on which to build an information revolution will be in order.

INFORMATION TECHNOLOGY COMPONENTS OF THE NEW INFORMATION AGE

- Invention of the Mainframe Computers acting as the first information repositories
- Invention of the Minicomputer
- Word Processor which appeared as a special hardware quickly disappeared to be embodied in PC software for Word Processing and Desktop Publishing
- Personal Computer (PC)
- Development of Computer Network and linking of PC's and Workstations to a central machine
- Development of LAN, linking individual groups of PC's together often with a minicomputer as a shared repository.
♦ Development of WAN via satellite or landline, linking users in one network with information stored on a remote machine or with users on that network

♦ Creation of Optical Storage Device capable of mass storage of text and document images (Portable on-line libraries)

♦ Creation of Document Scanning Technology (Electronic Microfilm)

♦ Invention of CD-ROM which is becoming the dominant distribution medium for all documents / information for a wide audience

♦ Invention of OCR and Intelligent Character Recognition for converting older and incoming documents into a medium, which can be understood and indexed by computers. Invention of optical Juke Book for storing vast image and document libraries.

♦ Emergence of Relational Databases making separation of data and program a reality and making classes of information 'stored once' reusable in many applications.

♦ Creation of Client Server Computing making separation of the interface from the central information repository encouraging shared data and collaboration

♦ Evolution of Massive Parallel Processing

♦ Invention of Text Retrieval, opening up the potential for content based searching of unstructured information the key to unlocking the value of documents.

♦ Creation of Electronic Mail Systems for providing much more than message between people and for moving information around efficiently.

♦ Creation of electronic Workflow and Document Routing, removing the need for serial processing of documents and freeing us from the wait state which reliance on paper imposes.

♦ Creation of electronic Document Viewing Technology the means by which one could eliminate paper from the equation much of the time.

♦ Emergence of UNLY & Windows NT (possibly the nearest we shall ever get to a universal operating system)

♦ Emergence and domination of MICROSOFT and Windows as a generic PC-based user interface.
Invention of Object Databases and Document Markup Standards.

Speech Recognition Technology to make data input just a matter of speaking into a machine the end of the keyboard eventually.

From the above, one can recognise the role of IT as a tool in IM. Further, comprehensive treatment of the application of IT for various library housekeeping operations, acquisitions, classification, cataloguing, circulation, stock taking, serials control, etc. can be found in library literature and hence not discussed here. The role of networks, especially the arrival on the scene of INTERNET, has completely revolutionised the entire gamut of activities that constitute library and IM, be it Collection Management, Information Services Management, Document Delivery Services (electronic), etc. (IASLIC conference 1997, Chaudhary 1996, Seetharama 1996). However, some of the crucial issues that need to be addressed in a network environment include copyright management, standardisation, training and education, as these would facilitate effective utilisation of valuable resources and power tools available on networks.

3.2 Standards

Standards may be considered as important tools in IM. For example, Indian Standards Institution (now called Bureau of Indian Standards) have developed and published a number of Indian standards for documentation pertaining to bibliographical references, book binding, books and periodicals, cataloguing, classification, library and archives building, furniture, lighting, microfilms, proof corrections, typography etc. In addition, a number of institutions and individuals have formulated library standards, both official and non-official, useful in the planning and management of libraries and information centres. Similarly, British, European and International Standards for quality systems have been developed and if implemented successfully would lead to improved quality, reduced production cost, and enhanced ability to demonstrate credibility to the potential customers.
On the other hand, advent of computer communication facilities and their use in development of bibliographical databases has raised the hope of developing a Universal Bibliographic System through the cooperation of several national and international organisations. Consequently, standardised machine-readable bibliographic record formats like USMARC, UKMARC, UNIMARC, CCF, and ISO-2709; the international standard format for bibliographic information interchange on magnetic tape was developed. This record structure as a basis for exchange format is also being used in its logical aspects for formatting of bibliographic data sent online and stored on other media such as floppies and CD-ROM.

3.3 System Analysis

System Analysis (SA), a tool for IM has proved invaluable in analysing complex organisations and solving problems resulting from organisations in conflict with an environment dominated by change and the uncertainty that inevitably accompanies change. But its use in library and information environments has been limited. Increasingly, however, in recent times, libraries are becoming aware of its potential usefulness to analyse and help solve their problems. It is obvious that this management technique is applicable at many levels of operation that can be circumscribed as "Systems" for study purposes. It has been proved beyond doubt that SA has a strong influence on various fields of study covering the entire spectrum of library and IM - - planning and designing of information systems including computer based information systems; costing and economics of information systems; Staffing; Evaluation of library and information systems, staff, future policies and direction; Bibliographic Control; Collection Development; Library Automation, including automated acquisition, serials control, circulation including inter-library cooperation; Human-Computer interface design; Selection of Software Packages, etc. While the future of SA in library and information environments is promising, it should be realised that SA is a tool or extension of management and therefore must be controlled by management and not allowed to control or replace management.

3.4 Bibliometrics: A Tool / Technique for Information Management
While British Standards Institution has defined Bibliometrics as "the study of the use of documents and patterns of publication in which mathematical and statistical methods have been applied", Sengupta defines it as "the organisation, classification and quantitative evaluation of publication patterns of all macro and micro communication along with their authorship by mathematical and statistical calculus". It is a quantitative science and is divided into descriptive bibliometrics (productivity count) and evaluative bibliometrics (literature usage count). The techniques of bibliometrics have extensive applications equally in sociological studies of science, information management, librarianship, history of science including science policy, study of science and scientists, etc. Some of the areas of application where bibliometric techniques have been used are:

1. To study research trends and growth of knowledge
2. To estimate comprehensiveness of secondary periodicals
3. To identify users of different subjects
4. To identify authorship trends in documents on various subjects
5. To measure the usefulness of retrospective and current awareness services including SDI
6. To identify past, present publishing trends as well as forecast future publishing trends.
7. To develop experimental models.
8. To identify core periodicals in different disciplines (through application of Bradford's Law of scattering and citation Analysis).
9. To formulate stacking and weeding policies
10. To initiate effective multilevel network system
11. To formulate collection development/management policy
12. To study obsolescence and dispersion of scientific literature
13. To study productivity of institutions / individuals and disciplines
14. To design automated language processing for autoindexing, autoclassification and auto-abstracting
15. To develop norms for standardisation

In this context, Zipf's Law, Lotka's Law, Bradford's Law of Scattering, etc. have been found to be useful.

3.5 Work Analysis Techniques

In managerial work, it is essential to analyse operations step-by-step, as this would facilitate efficiency and effectiveness of the operations. Several standard techniques have been developed to aid this type of work analysis. Some of the techniques of work analysis that will be useful for IM situations are listed below:

BLOCK DIAGRAM ... is a graphic representation of a series of operations, processes or subprocesses that collectively comprise an organisation/system.

FLOW DIAGRAM ... gives a graphic view of a work area and the management of personnel and materials within that area.

FLOW PROCESS CHART ... is a graphic means of portraying the work involved in a job where the person or the product charted moves from one workstation to another. It includes the distance travelled and the amount of time required performing each operation.

DECISION FLOW CHART ... can be defined as a graphic means of representing workflows in which numerous decisions are made. In computer parlance, the decision flowcharts are referred to as flowcharts.

OPERATIONS ANALYSIS .... is the study of the motion of the hands, eyes, and feet of an individual who is working on a particular activity in one location. It is effective when used on jobs that involve a lot of repetition.
FORM ANALYSIS ... is a process by which each form(s) is reviewed annually to determine its functions and efficiency. Automation in libraries, however, has brought about a sea change and has resulted in reduction of forms/paper work to a great extent.

MAN-MACHINE CHARTS ... are designed to analyse the work relationship between people and machines. These charts help us to find out the efficient way for the use of library equipment and personnel and the very idea of baying or hiring of a service.

OTHER TECHNIQUES OF WORK ANALYSIS include:

MULTIPLE ACTIVITY OR GANTT CHART ... is a type of flow process chart that has been modified to show processes involving the movement of more than one person or product e.g.: stock taking, shifting of books to a new building etc.

MICROMOTION ... study is a technique of recording and timing an activity by means of a clock and a motion picture camera.

In short, these techniques facilitate efficiency and effectiveness of a library or an information handling organisation by studying its operations in detail and pointing out the inefficiencies or wastage in time, workflow or movements of individuals handling the operations.

3.6 Monitoring Techniques and Controlling

While controlling usually refers to checking, verifying, testing, reputating, exercising restrain or directing influence in order to successfully carry out a management process, monitoring involves looking for faults, performing of duty, giving advice and instruction and exercising caution. A monitoring technique is a time-negotiated procedure on how allowed resources will be committed to achieving objectives. It is a guideline, a tool or an aid. The best techniques are those that are not rigid as they have provisions for adjustments as future events become known. These include:
OPERATIONS RESEARCH (OR) ... which can be defined as the application of mathematical models that permit comparisons of alternative courses of action and the determination of the course that will bring maximal results. If uses mathematical techniques like linear programming, probability theory, queuing theory, network analysis, etc. OR may play a part in the following areas of library and information management. long term planning, resource allocation, marketing including advertising, investment on new facilities, location of library, acquisition policy, loan policy weeding policy, inter-library loans, manpower planning, information services design, networking, user behaviour, etc.

MANAGEMENT INFORMATION SYSTEM (MIS) ... can be defined as a normal system (tool) to provide all levels of management with all the relevant information they need with which to make appropriate decisions for the total control of an organisation. MIS has been found to be valuable monitoring technique. Changes occurring in computer technology also indirectly enhance MIS development in future. Some of these include faster processing speeds, greater disk storage capacity multiprocessing and use of generalised software.

MANAGEMENT BY OBJECTIVES (MBO) .... is a technique of obtaining agreement between managers and their subordinates of the goals, targets and standards the latter are expected to achieve so that they and their superiors have a more quantifiable and objective measure of how well they are performing. It is thus a monitoring technique, which has been effectively used to integrate individual and group goals of a library or any other institution.

NETWORK ANALYSIS ... is a technique for planning and controlling complex projects and for scheduling the resources required on such products. It achieves this aim by analyzing the component parts of a project and assessing the sequential relationship between each event. The results of this analysis are represented diagrammatically as a network of interrelated activities. A number of network techniques have been developed, PERT (Programme Evaluation and Review Technique) and CPM (Critical Path Method) being the most commonly used techniques in libraries and information environment. They help in designing,
planning, co-ordinating, controlling and in decision making in order to accomplish a project economically in the minimum available time with the limited available resources. Examples of projects include construction of library building, design and development of collections and information services.

OTHER MONITORING TECHNIQUES ... or methods like appointment of consultants for finding solutions to problems which seem to be intractable and in an area unfamiliar to the organisation, or where previously applied solutions are no longer effective. Their job as experts would be to monitor, guide and control the activities they are engaged in. These consultants may be called in libraries and information centres for the following reason:

1. To advice on ventures such as the installation of new equipment, penetrating new markets or introducing new services or products.
2. To restructure the information organisation or management pattern.
3. To raise new capital or attract funds or invite project proposals.
4. To advise on relocation.
5. To sort out difficulties being experienced in functional areas where internal solutions have not been effective, etc.

On the other hand, a budget is one of the best and most important monitoring devices as it reflects the goals and objectives of the information institution. Budgeting helps in utilising the funds in the best possible manner for the effective running of the organisation. Budgetary control, therefore, is not only a financial plan but also a device for control, coordination, communication, performance evaluation and motivation. PP13S and ZBB are good budgetary monitoring techniques that can be applied in library and information environments.

3.7 Evaluation Techniques

Evaluation of any service, process or activity in management usually refers to "determining its worth" or "assessment, valuation, appraisal, criticism, review, calculation, measurement"
or need to know closely the utility. Evaluation thus is a matter of comparison of actual results, not only with anticipated results, but also with external standards, in the light of existing institutional realities which may be relevant to evaluating the future trajectory of the program or service and provide an objective basis for decision making. Some of the basic techniques that are applicable for evaluation process are:

- **Performance measurement** - helps us to decide how well the information system, service or resource is operating, compared with some theoretical maximum. Some of the performance measures are cost benefit analysis measures, decision analysis, etc. Two measures of great importance to ascertain the effectiveness of information retrieval are: Recall and Precision.

- **Performance Evaluation** - is an assessment of how well a system or service is working, according to some previously decided measure. Two sorts of measures can be used for performance evaluation - INPUT measures investigate from the viewpoint of its operators and look at the resources invested and how they are deployed; OUTPUT measures, try to look at customer satisfaction, and the extent to which the service is succeeding in its objectives.

- **Cost-Effectiveness Analysis** - is the relationship between the level of performance (effectiveness) and the costs involved in achieving this level.

- **Cost-Benefit Analysis** - refers to the relationship between the benefits of a particular product or service and the costs of providing it.

- **Bibliometrics** - is the application of various statistical analyses to study patterns of authorship, publication and literature use. Bibliometric techniques can be used for various purposes in libraries. They can be applied successfully as evaluation techniques. For example, to evaluate journal collection, evaluate productivity of institutions and individuals, etc.
3.8 Conventional Techniques

It may not be out of place to mention that librarians were the first people to bring some discipline and order to IM with their classification and cataloguing schemes (Cronin 1985). However, sometimes it is argued that with automation of information retrieval it is possible to dispense with traditional methodologies / techniques for organising information, in particular classification. The strongest counter argument to this is that classification underlies all thinking; thus it would be prima facie surprising if it found no place in online systems of the future. Svenonius (1983, 1991) has identified some uses of classification in online retrieval systems:

- **Classification can be used to improve recall and precision and to save the time of the user in keying in search terms.**
- **Perspective classification can be used to contextualise the meaning of vague search terms, enabling the computer to simulate in part the negotiation of a search request carried on by reference librarians.**
- **An important use of traditional classification in online systems is to provide a structure for meaningful browsing.**
- **Classification can be used to provide a framework for representation and retrieval of non-bibliographic information.**
- **Automatic classification can be used to collocate citations in ways not possible in manual systems, e.g., by similarity of linguistic features.**
- **Classification can be used to achieve compatibility of retrieval languages by serving as a mediating or switching language.**

In brief, classification has such an important place in online systems, that we should prepare for a resurgence of interest in both its theory and practice. A similar line of thinking in the work of Stephen Walker (1991), Liu and Svenonius (1991), Nohr (1991), Watanabe (1994) who have used classification techniques in the context of OPAC searching. Similarly, Library
of Congress Subject of Headings List, Rules for Subject Cataloguing (RSWK), Thesaurus, Keyword Indexing have been used for subject search and retrieval in OPACs.

To state that classification has a role in information management would be to state the obvious. It may be in relation to the users interest profile construction, document profile construction, arrangement and presentation of information, database creation, etc. Neelameghan (1992) has shown how Normative Principles of Classification are useful in designing of a database. According to him, they are useful in all the three planes of work.

Idea Plane:

1. Identifying data entities (Object about which information is to be collected for use)
2. Selecting attributes of data entities of interest to users
3. Selecting data model (scheme to map entities and relationships)
4. Dividing data entities by common attributes into smaller units
5. Grouping, organizing, arranging the units derived in 1.

Verbal Plane:

6. Naming fields, data elements

Notational Plane:

7. Assigning tags

In other words, in the preparation of the Field Definition Table (FDT), a pre-requisite for database creation, classificatory principles have a role to play. Further, in studying the information needs of the potential users, classification is of great help in the case of specialists belonging to a particular discipline. But, in the case of planners and decision makers, it is rendered difficult as the information needs are not structured according to
subjects in the usual sense of the term, but are essentially function or task-oriented. Therefore, an alternative approach—a Model or Reference Framework according to which planning and decision making programmes are conceptually analysed into different phases, sub-tasks, activities, etc. and the information support needed for each are identified. When this is done (which is nothing but classification in one sense), it would be possible to select/extract relevant data and information from different sources/databases and repackage them into relevant subsets for convenient use at the different stages of planning work. It has also been shown by Seetharama (1992) that classification has a role in the generation of information services and products, especially in the arrangement of ideas in information consolidation products.

In the context of bibliographic description (cataloguing) documents, the role played by AACR and CCC in the development of machine-readable bibliographic record formats—US MARC, UK MARC, UNIMARC, CCF, etc. is well known.

4. CONCLUSION

Whatever Information Management is, it perhaps, is concerned with obtaining the best possible value for money from an organisation's information resources. In other words, the buzz words in this context would be economy, efficiency and effectiveness in relation to the information or record life cycle—creation, communication, use, storage and disposal of information. To achieve the 3 Es, numerous tools and techniques, both conventional and non-conventional, have been developed. These include tools and techniques, such as, Information Technology, Standards, System Analysis, Work Analysis Techniques, Monitoring Techniques, Evaluation Techniques, Conventional Techniques of Classification, Cataloguing etc. As a matter of fact, the entire lot of Management Techniques (See Appendix) seems to be applicable to Information Management. Since these techniques have been widely discussed in library and information science literature and are well known to information professionals, details of these have not been given.
While IT may be able to handle some of the problems within the present systems development paradigm presently, a time may come when it would be difficult to find solutions leading to major breakdowns in information systems. Hence, there is a need for research in the area of information management, particularly in the area of innovations including: Use of Artificial Intelligence; Improved methods of data storage and retrieval behaviors (Holtham, 1996). In this context, Holtham's observation that "Information is more critical to success than IT, but IT gets most of the attention and the great bulk of the investment in managerial time, financial investment, and media attention... Continuation of this imbalance (between information and technology) will be the heart of failure to achieve the full benefits from information systems" is worthwhile recalling.

To conclude, as Best puts it "The field of Information Management has never been more exciting than it is today; our pressing needs, the technologies (and techniques) available to us, and the demands of our business, governments and society as a whole present a challenge to us to find ways of satisfying demands for ever more relevant, up-to-date and accurate information at an economic cost. Whether we succeed or fail is up to us".

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MANAGEMENT TECHNIQUES: AREAS OF APPLICATION

A: TECHNIQUES APPLICABLE TO THE SYSTEM AS A WHOLE

1 System Analysis:
Planning and designing of systems Determining requirements of a new system
Formulation of objectives/goals
Prelude to library automation
Decision making in general
To study library system
To solve systems problems
To improvement in system performance
Total number of article percentage

2 Problem Classification, Logic Tree, Critical Examination:
Designing developing and operating information services

B: TECHNIQUES APPLICABLE TO LIBRARY OPERATIONS AND SERVICES

OR Techniques in General:

Long term planning
Assisting library management
Resource allocation
Decision making in general
Decision making in regard to Investment in new facilities
Policies for acquisition of stock
Loan policy
Planning of information services
Designing, developing and operating of information services
Implementation of information services
To improve information services Advertising and marketing library services
Weeding policy
Library location

Decision Theory Model:
Decision making in regard to information retrieval problem
Evaluation of retrieval system
Evaluation of information services
Graph Theory Models

PERT
Planning of information services

CPM
Planning of information services

Queuing Theory
To analyse the problem of congestion at card and Book catalogues

Queuing Network Model

Decision rules for interborrowing

Queuing and Markov Model
Staff schedule determination

M/M/S Queue Model & Dynamic Programming
Resource allocation

Queuing Theory & Dynamic Programming
Resource allocation

Stochastic Shelf Reading Model
Shelf reading policy

Linear programming
Resource allocation

Linear Programming Model
Journal selection

Non Linear Programming Model
Resource allocation

Dynamic Programming
Allocation of funds
Loan policy

Computer Simulation

Evaluation of retrieval system
Evaluation of information services

Monte-Carlo Simulation
To simulate variable loan and duplication policy

Mathematical Model
To estimate measures of effectiveness
Journal selection
To determine acquisition rates

Acquisition of Books
Decision of rules for inter borrowing
To predict a library's circulation
Evaluation of information services

Book Budget Model
Allocating book budget

Cost Effectiveness Model
To compare the cost of manual and mechanized circulation services

Network Flow Model
Determine the optimum shelf heights to effect economy

Computer Programme Model
To improve directory performance

Shelf Reading Model
Shelf reading policy

WORK ANALYSIS TECHNIQUES

Analysis and evaluation of current library procedure

Flow Charts
Multiple activity charts
Decision flow charts
Forms control programme
Work sampling
Cost analysis

STATISTICAL TECHNIQUES

General Statistical Model
Projection of the number of data bank users

Graphic Techniques

To evaluate library and information functions
Graphic Models Designing, developing and operating information services.

Time Series Analysis & Multiple Regression Techniques
To forecast library growth

Regression Techniques
To predict, evaluate and control the performance of bibliographic search procedures

SURVEY TECHNIQUE

Survey Techniques in General
Decision making in regard to Investment in new facilities.
Data for a cost benefit study of manually
Produced Current Awareness Bulletins
Data on library performance & operations
Data on user failure, in the periodical section
User's studies

Use Survey
Decision making in regard to:
Establish a new branch library
Users studies .pa

Diary Survey
To plan staffing

Management Survey
Costing service and functions

Failure Survey
Data on stock failures
User's studies

User Frustration Survey
Data on user frustration
Performance of acquisition policy
Circulation policy
User studies.

Journal Usage Survey
To determine trends in journal usage
User studies

User's Opinion
To determine trends in journal usage
User studies

Questionnaire Survey
To determine trends in journal usage
User studies

Statistical Survey
To determine trends in journal usage
User studies

Document Delivery Test
Evaluation of Information Services (Providing Documents)

Standard Sampling Theory
To study library book losses
MRAP (Management Review & Analysis Programme)
To examine the operational decision making process
To conduct a management self study
Internal evaluation of library management policies
To improve the management of research and university libraries.
To view and analyse the current management policies and problems

C. TECHNIQUES FOR PERSONNEL MANAGEMENT MBO,

Formulation of objectives / goals
Planning library operations
Improve administration
To plan staffing
Staff management and staff participation
Participative decision making
Training & development of personnel
Evaluation of performance
To solve management problems
Planning of information services
Evaluation of information services

Theory (Application)
Personnel Management

Participative Management
Staff participation in decision making

Consultative Management
Staff participation in decision making
Job Analysis, Job Evaluation, and Job Descriptive Index
Staff Assessment, In-House Supervisory Programme
Personnel selection, motivation, job satisfaction,
Professional development, employee communication
and implementing personal policy

D. TECHNIQUES FOR FINANCIAL MANAGEMENT

PPBS
Resource allocation