CHAPTER -2
REVIEW OF RELATED LITERATURE

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2.0 Introduction

An attempt has been made in this chapter to review briefly important literature and studies on information technology applications, library automation efforts, integrated library software, usage of library housekeeping operations in universities with a view to justifying the need and relevance of the present investigation. It is believed that this would give some impetus and direction to the researcher in his work. The researcher has used the Library and Information Science Abstracts (LISA), INSPEC Database, INGENTA Portal, Emerald Database and Google Scholar to gather the relevant data. It was not possible to refer to all the original documents, but all possible select documents were consulted. Some published papers in the application of IT in library services have also been consulted for current trends available in the area of IT application.

Reference format followed according to the APA Citation Style, Publication Manual of the American Psychological Association.

For the sake of convenience, the literature has been discussed and reviewed under the following subheadings:

- Information Technology Applications in Libraries
- Library Automation – General Aspects
- Studies on Library Housekeeping Operations
  - Acquisitions
  - Serials Control
  - Catalog
  - Circulations
2.1 Information Technology Applications in Libraries

IT has a huge potential for providing a wide range of new opportunities as also for offering better solutions to achieve greater levels of efficiency, productivity and higher standards of quality services in libraries. Several people have given varied reasons that contributed to the IT applications in libraries. Library automation is one of the major applications of IT in libraries. It implies a change from the manual system to the application of computers and other modern equipment to library operations and services. During the last decade, IT has played an increasingly influential role in Library management system as they have immense capabilities in handling and processing huge volume of information held in libraries. A large number of studies have investigated the utilization of technological applications in library and information centers all over the world.

Gopinath (1995) observes that the developments in IT have been revolutionizing the library and information services. He stated that the technology is evolving rapidly and is providing additional facilities such as network access, electronic document delivery, information interfacing and modeling facilities etc. IT has to be built on a flexible frame to provide instant, conducive approaches towards identification, location, access, retrieval and usage of the information to satisfy the end users.
Sujatha (1996) has carried out a study on resource sharing and networking of university libraries in Andhra Pradesh. She suggested the networking of university libraries in the state to promote the sharing of resources as there is a large scale duplication of serials and books in these libraries.

Ravichandra Rao (1997) has discussed the status, problems and the future of automation in academic libraries in India. He states that automation activities in academic libraries slowly picked up with the support from INFLIBNET, UGC, NISSAT and other similar agencies combined with increased awareness of IT and its applications among librarians. They are beginning to use E-mail, CD-ROMs, LAN, machine-readable catalogue, etc., for sharing their resources.

Ansari (1998) reviewed the computerisation activities in 14 universities of Bihar and found that four had received financial assistance from INFLIBNET for computerisation of their libraries. He discussed certain problems such as trained manpower, IT infrastructure, etc. and offered a few suggestions i.e. availability of cost effective library automations software, hardware, training for improvement of computerisation process in university libraries of Bihar.

Venkataramana Rao and Chandrasekhar (1998) states that effective use of IT in libraries increases efficiency in operations, eliminates repetitive nature of works, improves the quality and range of services, facilitates easy and wider access to all kinds of information sources, facilitates faster information communication, increases morale and motivation of library staff, facilitates cooperation and resource sharing, saves time, space and resources, improves productivity and image of the library.
Chandran and Ramesh Babu (1999) have conducted an opinion survey to study the attitude of 50 staff members towards use of IT in 16 academic libraries. They have found out that the library staff have good interest in automating library services and expressed greater appreciation for new technology as it can help in providing better services to their patrons. They have also found out that insufficient funds is the major reason for poor state of IT applications in libraries, followed by lack of support by administrative authorities and lack of trained staff.

Rama Reddy (2000) states that the emergence of information technologies have created greater opportunities in the libraries in the 21st century. The users' demands are forcing the application of new technologies, new modes of access to knowledge resources and new techniques of knowledge search etc in the libraries. The professional librarians need to enrich their knowledge with updated information on the pattern and working of different types of library collection and services with utilization of modem IT tools.

Kannappanavar and Vijayakumar (2001) surveyed the use of IT facilities, in-house databases, access to networks, library services and barriers to IT applications in two agricultural university libraries in Karnataka. They found that none of the university libraries were having databases and full implementation of IT applications.

Seljak and Seljak (2002) report that the COBISS system interconnects over 250 of the largest Slovenian libraries into a uniform Slovenian library information system. COBISS is also used by other independent library systems in some countries in the territory of the former Yugoslavia. The development of the COBISS shared cataloging system and services runs parallel with the second
software generation (COBISS2). Authority control and other services were introduced on COBISS2, and the development of interlibrary loan applications, acquisitions, and other services are being implemented on COBISS3.

Covey (2003) reveals that academic libraries are not meeting users needs and expectations for easy access to online library resources. The survey results indicate that technologies currently deployed to support off-campus users are inadequate and problematic for both users and libraries. A new approach is required to improve service quality. The Internet2 Shibboleth software offers a viable alternative. Access to the Internet has precipitated new information-seeking behaviors and expectations.

Sinha and Satpathy (2004) explain resource sharing by stating its objectives and need in the areas of science and technology specifically to meet the demand of users in the face of proliferation of information. They discuss the need for automation and networking of libraries by stating the aims and objectives of library networks, types of networks available in the country including UGC and NISSAT sponsored networks and also some international networks.

Jeng (2005) reveals that to develop and evaluate methods and instruments for assessing the usability of digital libraries. He discusses the dimensions of usability, what methods have been applied in evaluating usability of digital libraries, their applicability, and criteria. It is found in the study that there exists an interlocking relationship among effectiveness, efficiency, and satisfaction. It provides operational criteria for effectiveness, efficiency, satisfaction, and learnability. It discovers users' criteria on "ease of use," "organization of information," "terminology and labeling," "visual attractiveness," and "mistake
recovery." Also common causes of "user lostness" were found and "Click cost" was examined.

Rosenberg (2006) reports the findings of the survey of the International Network for the Availability of Scientific Publications (INASP) to find out the current state of digitization in university libraries in sub-Saharan Anglophone Africa in 2004. The study reveals that university libraries in Africa have progressed towards establishing digital library services at very different speeds and levels. For the majority of libraries e-resources are available but facilities for access are very poor. The acquisition and implementation of library management system appears to be an essential building block in the construction of a digital library. All e-developments depend heavily on external funding and will continue to do so. Lack of funding and lack of or retention of trained staff is the key challenge for the future.

2.2 Library Automation – General Aspects

The automation of libraries and information centers in the India started in middle of the 1950s till the concept of automation was centered on the use of computers for housekeeping operations and information services by individual libraries. There are certain factors responsible for the automation of the libraries. Information explosions, increased user’s demand, labour intensive nature of work, changing concepts of documents. Application of modern management techniques, reduced response time and need for resource sharing are important elements. With the tremendous capabilities of computer, libraries started using computers for the in-house operations.

Gupta (1985) presents trends of development in information technology and describes computer facilities, including the software available in Nigeria.
CDS/ISIS has been used in the preliminary stage in the absence of a full fledged library automation software. He stresses the need for introducing courses in computer application for educating and training information professionals in Nigeria.

**Woods (1986)** has summarised the responses to a letter of enquiry sent to all British university libraries in 1984. He describes the history; current position; and future plans with respect to automation in the UK university libraries. He covers acquisitions, cataloguing, Circulation control, serials as well as staffing and networking.

**Lim Hong Too (1987)** has conducted a survey in Singapore in order to study the extent of development of library automation in major libraries and most of the smaller ones in Singapore. The survey was carried out by means of questionnaires, sent to the various libraries. He observed in his study that many of the libraries were automated and providing services based on the information technology.

**Barraclough (1988)** presented the results of a project to recommend a suitable information retrieval package for a nursing library in Leeds. The 'Bookshelf' system had been implemented in the library. She has evaluated the systems Adlib-2; Bookshelf, Inmagic Biblio, Librarian; and Microlibrary.

Libraries use technology in general, and computers in particular, to automate a wide range of administrative, public, and technical service tasks. Designed as an overview of major facets of automation activity, **Saffady (1989)** surveys the state of computer applications in six areas of library work: circulation control, descriptive cataloging, catalog maintenance and production, reference service, acquisitions, and serials control.
Kaul (1990) discusses the progress of library automation in the European countries. Provides an overview of networks in the UK with special reference to the British Library's automation programme and key areas of work the Joint Academic Network (JANET), and the CATS on-line cataloguing system, developed by the University of Cambridge. Describes other cooperative projects including the Commonwealth Agricultural Bureau International (CABI) data base highlighting their activities. He lists broad projections stressing the need for automation programmes in Indian libraries.

Harinarayana (1991) describes libraries as one of the important components of the modern society. By automating their operations and services, modern libraries are undergoing rapid transition. Librarians are now facing the problem of how to automate. Any automation project can be viewed through three stages: planning, design and operations. Planning includes the study of the feasibility of the project. Design encompasses the logical as well as physical design of the system. Implementation and evaluation form important steps in the operational stages.

Vishwanathan (1991) reports that many libraries around the world have automated one or more of the following functions: acquisition, serials control, circulation, cataloguing, interlibrary loan. For this automation information technology offers two approaches at the system level, i.e., integrated systems approach and distributed systems approach. In the integrated systems approach, a single system is used to implement automation in all the functions or activities. A distributed system approach permits incremental growth with low initial investment.
Ashford, Hariyadi and Nanny (1992) states that a project to develop a national academic union catalogue for the 49 universities and major teacher training colleges of Indonesia has completed its design stages, and procurement of software and computing equipment will follow. The operational centre will share a site in Depok with the University of Indonesia and the use of national plan and end users’ requirements in library automation as a whole. The use of CD-ROM is proposed as a distribution medium for the union catalogue of at least 500,000 titles.

Larsen (1992) reports that more than 1300 large integrated library systems are installed in the EC (European Community) member countries. This figure represents a growth rate of more than 525% over the last five years. New suppliers have achieved some 36% of the market. The number of suppliers of large integrated systems has increased from 12 in 1986 to more than 30. More than 3600 small integrated systems have been installed by some 40 different suppliers shown in a study carried out in 1991 as background for the Commission of the European Communities (CEC) action under the Libraries Programme.

Bhargava, Srivastava and Murthy (1993) reports that a library automation software package (SANJAY) has been developed in the CDS/ISIS V2.3 environment by using extensively the Pascal interface to meet the requirements of a model library. It is an interactive, menu driven, and user-friendly package which carries out routine functions of a library.

In the case study, Konnur and Rajendra (1994) explain their experiences of automation at the library of University of Pune. They say that major activities like cataloguing, acquisition, circulation and serials, etc were
They also explain that the major problem faced by them was the maintenance of hardware and the inadequacy of staff in handling such automation.

Tang (1994) has reported that National Library of China (NLC), Beijing, played an important role in the national standardization of bibliographic control and in library automation and networking in 1991. It developed an integrated library automation system with Japan's NEC, Inc. This system is capable of handling acquisitions, cataloging, circulation, and OPACs in simplified Chinese characters as well as in English. There are currently more than forty libraries that are using the system.

Gorny and Jazdon (1995) present the results of a 1995 survey on library automation development, the quality of the computer infrastructure and the use of electronic media in Polish scientific libraries. University libraries are generally more advanced in their automation efforts and access to electronic media. There is no unified programme of library automation for scientific libraries in Poland.

Satish Kumar and Kar (1995) describe the use of the CDS/ISIS bibliographic database package within the Tata Energy Research Institute Library in Delhi. They indicate the capabilities of the package and state the hardware requirements and package availability (from UNESCO). They have assessed the applications of the package through a comprehensive survey of the literature on its use within libraries throughout the world.

Carrigan (1996) reports the results of a questionnaire survey of the chief collection development officers at 108 university library members of the Association of Research Libraries (ARL) to determine the extent to which data
produced by computerized methods are used to guide collection development. He concludes that the promise of better collection development management, as a result of the introduction of OPACs and other library automation methods, is yet to be fulfilled. The reasons given range from the lack of suitable software to skepticism about the value of computerized circulation control data for collection development.

Ravindran (1997) says that the success of any library or information center lies not only in its own resources, but also in being able to identify and enlist various sources of information that are available elsewhere and in developing the requisite tools and systems needed to tap into those resources. The minimum requirement to ensure such sharing of information is a common format for the maintenance of databases and the required technology inputs, including software packages. An overview of various software products that are available for library automation and the management of bibliographic databases is presented.

Hackett and Geddes (1998) present an overview of Horizon, a client-server library automation system from Ameritech Library Services. In the UK, the Universities of Huddersfield, Staffordshire, Middlesex and Strathclyde were among the first to opt for Horizon, as did Birkbeck College. They describe hardware and operating system requirements, and consider the functionality of the principal modules, focusing on the academic library setting.

Keller and Neubauer (1999) describe the academic and political environment, which has significantly influenced the development and character of Swiss university libraries. Swiss higher education, with the exception of the Swiss Federal Institutes of Technology, is organized primarily on a cantonal
basis, which is an impediment to the formulation of a unified national library policy. They give an overview of the organization and the responsibilities of Swiss university and other higher education libraries.

**Ming (2000)** describes the development of library automation systems in mainland China. The Project of Chinese Information Process marks the beginning of library automation, and the progress of computer technology and network application which followed it are described in four stages: (i) preparation and experiment (1974-1982); (ii) single function and multifunction systems (1983-1996); (iii) integrated online library systems; and (iv) networking and digitization (1997 on). The current library automation systems of mainland China are mainly developed by commercial software companies, both domestic and foreign: outlines their 5 chief features.

**Davarpanah (2001)** examines the level of information technology (IT) application in university libraries in Iran. As a background, an attempt was made to present current status of IT application in the libraries. In his study the whole population of 79 university libraries under the jurisdiction of two ministries: Culture and Higher Education (MCHE) and Health, Treatment and Medical Education (HTME), was surveyed. The author concludes that the automation of Iranian university libraries is a continuous exercise.

**Bregzis, Gotlieb, and Moore (2002)** reports that in 1962, the Province of Ontario established five new universities and asked the University of Toronto Library (UTL) to help build libraries for them, which it did. They describe that the main task was to determine a record format, coordinated with that developed later for the Library of Congress's MARC project. Eventually, UTL established the University of Toronto Library Automation Systems. The early decisions
have enabled the UTL to develop electronic indexes and full-text document distribution systems at a rate that has kept it among the world's leading libraries.

Seneviratne and Amaraweera (2002) outline the historical background to the use of computers for library automation in Sri Lanka with special emphasis on the use of CDS/ISIS. They describe the implementation of a prototype low cost world wide web based library automation system as a solution to the information management problems in Sri Lankan libraries.

Gaur (2003) has analyzed the present status of digitisation of Indian Management Libraries through a survey. Regarding the issues such as library automation, development of digital libraries, he found that 45% of libraries have not yet started automation; out of 55% of libraries that have started library automation, only 16% have been fully computerised. Thus, in Indian libraries the digital gap is widening day by day. The author argues that it is high time management libraries made computerisation their number one priority.

Venkataramana Rao and Chandrasekhar (2003) report that Central University (CU) Libraries in India are currently at various stages of advancement in the use of information technology (IT). They present the results of a research study conducted in order to survey the use of IT in CU libraries. It covers computers and software packages used, computerised library operations, development of databases, bibliographic standards used, computerised information services, level of participation in networks and computerised facilities offered to users, etc.

Sinha (2004) report that the North Eastern India is not lagging behind which has also experienced the changes in the library automation and networking activities, which is possible mainly due to inclusion of 12 university
libraries for financial assistance under INFLIBNET Programme, which made the initiation of Information Infrastructure Development of University Libraries and Database Creation Work for Library Automation & Networking possible.

Cholin (2005) states that IT has revolutionized the information handling activities in research and academic libraries in India. The university libraries, as Centres of information services, have largely benefited by the rapid changes in the IT. The university libraries in India are at various stages of development in the application of information technology tools in their day-to-day activities. The author gives an overview of Information Technology implementation in different university libraries in India that provides effective access to resources available within universities and elsewhere. He also discusses the role of the INFLIBNET Centre in the overall development of university libraries across the country with special emphasis on efforts through UGC-Infonet E-Journals Consortium.

Suku and Pillai (2005) have presented the scenario of automation activities of university libraries in Kerala. The survey findings mainly cover various aspects of library automation such as information technology infrastructure, in-house activities, information services and their usage, manpower development, and budget. Authors discuss the role of INFLIBNET Centre in accelerating the automation activities of university libraries, especially in the context of the recently introduced UGC-Infonet programme. The problems encountered in this process are identified and possible suggestions are stated.

2.3 Studies on Library House Keeping Operations

The major areas in the housekeeping where computers are being used extensively are - acquisitions, serials control, catalog, circulations, etc. Each system involves a large number of operations and services.
Kumar, P.S.G. (1987:275) has surveyed 37 institutions, covering about 82 computerised programs in operation. 21 out of the 37 institutions have computerised only one operation. Six of them have computerised a couple of operations. Nine out of the 37 have computerised three to eight library operations. RRC, TIFR and BARC have not only taken the lead in introducing computerisation at the earliest, but have also tried to evolve a comprehensive computerised system.

Lin (1988) reviews the development of computerised library services in the Chinese People's Republic. He has discussed the important role of the National Library of China and recent developments in computerised acquisitions, cataloguing, circulation control, union Catalogues of periodicals, and on-line cataloguing. He has stressed in his study that education, training and use of standards are the keys to make the resource sharing a success.

Ramesh, L. S. R. C. V. (1998) argues that if libraries are to provide efficient services to enlightened users it is essential that the technical services should be well organized and up-to-date. He discusses the traditional methods of management of technical services departments prior to the introduction of computers and notes the great changes in the infrastructure of library technical services that have arisen in making them more useful and effective in university libraries through the application of information technology.

2.3.1 Acquisitions

Acquisition System is concerned with finding book selection sources, searching and selection of books required, placing of orders with a wide range of suppliers, keeping track of orders, receiving and recording of their receipt, settlement of invoices and maintaining detailed accounts of funds.
According to Kumar, P.S.G. (1987:262), computerisation provides the following benefits in classification; (i) Helps the classificationist in the selection of isolate terms, grouping and arranging them in hierarchical sequence; (ii) Helps a classifier in synthesizing the class numbers; (iii) Saves time by avoiding frequent reference to the schedules of scheme for classification; (iv) The constructed class number can easily be used as a query language in a typical retrieval system, and (v) Improves accuracy and speed in classification.

Chamberlain (1989) explains in his study that two technological developments, library automation and electronic publishing, are having a great impact on acquisitions in academic libraries. Automated acquisition systems have evolved beyond the fundamental ordering and receiving functions, with the advent of integrated systems, external interfaces with suppliers and local control through microcomputer-based support. Electronic publishing will bring about dramatic changes; among them, a change in focus from the acquisition of resources to access to information in electronic formats. The author concludes that this growing trend will influence traditional ordering policies, budgets and supplier services. Recent developments point to a shift toward a distributed acquisitions operation in academic libraries of the future.

Harbour (1994) has made a comparative study of the flowcharts of a highly simplified example of a manual and automated acquisition and cataloging system. He has found out that the number of steps in the computerised process can be reduced roughly by half.

Uma and Gangu (1998) report their experience of using Acquisition module of Libsys software in the Indira Gandhi Memorial Library, University of Hyderabad. The library initiated its automation programme in 1989, which is
now almost complete. Authors describe the conversion of acquisition operations from manual to automated, using the LIBSYS acquisition module.

Davarpanah (2000) discusses the university libraries in Iran and their collection development against the background of the country's ethnic makeup and Farsi (Persian) language. He reports the results of a survey of university libraries, including medical libraries, university libraries; and periodicals subscribed. He highlights the importance given to audio-visual materials, manuscripts and rare books and evaluates the relevance of available resources, problems of textbook provision, and the lack of acquisition policy encountered in the import of books and periodicals.

2.3.2 Serials Control

Serials include periodicals, newspapers, annuals, journals, memoirs, proceedings, transactions etc., of societies and monographic series. Serials are distinguished from monographs by their ongoing nature. The continuing nature of serials subscriptions creates problems and makes it a complex process requiring a separate control system. Serials management, an integral part of library operations, has become increasingly complex over the years. The emergence of electronic journals has made Serials Control still more complicated. Serials management has always been an area that is labour intensive, demanding high degree attention to accuracy and detail.

Ravichandra Rao (1983) state that an automatic serial control system should perform the following functions: (i) Ordering: Ordering new journals; Renewal/discontinuation; Sending reminders; Receiving the journals; (ii)
Reader Services: Preparation of a list of periodicals received; Preparation of a list of periodicals cancelled; Preparation of a list of holdings; List of holdings with their status (i.e., on shelf, in binding, in circulation etc.), and (iii) Management Services: keeping track of the amount spent on subscriptions, binding etc.; Estimation of the budget for the new year; Announcement of the missing serials for recording the same.

Schlembach et al (1996) describe a networked serials control system developed at the Grainger Engineering Library Information Center at the University of Illinois at Urbana-Champaign. The Grainger serials control system encompasses serials processing, public service, and end-user functions. The Grainger serials control system is designed: to expedite check-in, binding, and claiming within a graphical user interface; to provide expanded search capabilities and access points; to provide a Notes capability for public service staff; to provide a user-friendly interface for patrons; and to serve as a testbed for interface design and database techniques applied to serials control systems, and by extension to other search and retrieval systems.

Tuttle (2001) has explained how automation has affected issues related to journal publishing; and the impact of automation on library processes. The role of journals in scholarly communication has changed considerably as technology has advanced, as journal pricing and library processes such as acquisitions, cataloguing, preservation, and access have increased.

Rawat and Singh (2003) report that, of all the activities in library automation, handling of subscription to periodicals is definitely the most challenging, involving as it does in some of the most complex computing. In the absence of a satisfactory commercial system, the authors have worked out a
design and used it successfully at experimental level. The authors have used some of the Unix OS primitives to code this project. In conclusion, the authors present examples of data structure and some of the program subroutines operating on it.

2.3.3 Catalog

Cataloguing is one of the important functions, which link users' requirements to the documents in a library. Computerised catalogue is the most efficient tool in retrieving information about the documents in a library easily and quickly.

Lynch (1989) says that historically, library catalogs have been rather insular, often based on specialized hardware and/or operating systems lacking industry-standard networking capabilities. Network access was not a major consideration in the design or selection of these specialized systems. But when library automation systems are attached to the network as an afterthought, they often display unsatisfactory functional characteristics; libraries now face the realities of the wired campus environment and the collision between library automation tradition and the new world of networks.

September (1990) states that (i) The growing complexity of the card catalogue and the increasing cost of catalogue maintenance were identified as important factors for library automation, (ii) The database would provide cataloguing data, information about books not yet catalogued, books on order and items in circulation, (iii) As collections in libraries, especially in university libraries, expand and grow, it becomes more difficult to maintain the manual card catalogue, and (iv) Human errors occur as a result of misfiling. Misfiling of cards makes it impossible to retrieve materials easily.
Eniya (1991) reports that International Institute of Tropical Agriculture has used an integrated library software package for retrospective conversion of the card catalogue. The data conversion exercise has reduced 1,70,000 card catalogue entries to only 24,000 automated catalogue records having about 50 fields in each record.

Rama Reddy (1997) discusses the management of data correction of books database for the data entered during retrospective conversion operation and regular cataloguing function by using a format different from Libsys. He briefly describes the books database of the case study of the University of Hyderabad.

Michos, Stamatatos and Fakotakis (1999) reports that the language barriers present a major problem in the effectiveness of resource sharing and in common access to the resources of libraries. The authors discuss the TRANSLIB system, which consists of an integration of both new and existing multilingual information tools. This system takes full advantage of some AI-based methods in order to provide multilingual access to library catalogues.

Singh (1999) states that automating of housekeeping operations is a major achievement in the area of computer applications in libraries. Technology is the most significant factor forcing libraries and information centers to develop more effective methods of service delivery. Catalogs are being computerized worldwide to facilitate better access points and multidimensional searches in library holdings. The emergence of online catalogs offers improved access to a variety of databases. Examines the role of cataloging in the realm of automated library activities and services. He concludes that library catalogs must be maintained in such a way that they can serve the diversified needs of a wide range of users and systems.
Khalid (2000) reports the results of a questionnaire survey, conducted at seven university libraries in Saudi Arabia, in order to determine the degree of use of library automation for housekeeping activities, catalogue access and bibliographic databases searching. Results confirm that the use of automation in Saudi Arabian university libraries is less than that in the UK and Malaysia for housekeeping and bibliographic searching. He concludes that automation use can be increased by taking initiatives by professional organisations and Government agencies on planning of technology, implementing information policy, developing broader awareness for the use of technology in libraries, establishing staff training and development and user education programmes.

Needleman (2000) examines the Z39.50 Information Retrieval protocol and looks at some of the history of the protocol, its operation and some of the major projects that have made use of it. He concludes his report with some thoughts on how technology and technological infrastructure have changed in the years since Z39.50 was initially developed and deployed and where the protocol has so far lived up to its goals.

Singh (2004) discusses the definition, importance, advantages and disadvantages of the database approach. 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 has found out that the in-house data entry is fastest, most reliable and cheapest. Having created the database, its management
is also essential. The author therefore suggests that, there is a need for Database Administrator in each library.

Oduwole (2005) assesses the information technology used in cataloguing in Nigerian academic libraries. The author reveals that automation of the cataloguing process has increased the efficiency of the cataloguing processes in the Nigerian university libraries, which in turn has resulted in increased productivity. The high cost of maintenance of the TINLIB software was identified as the major constraint to the use of the software.

2.3.4 Circulation

Circulation procedure in a conventional system is very lengthy and time consuming. The use of technological devices such as computers, barcode scanners and its software in circulation helps in performing these routine operations easily and quickly. Academic libraries are the most suitable candidates for computerisation of circulation-control systems as they frequently have high-volume of circulating transactions per day.

Laxman Rao (1993) has studied planning and implementation of automated circulation system for Osmania University library system and indicated various benefits of automated circulation system.

Ganpule and Waydande (1994) state that circulation activity was considered on priority basis for computerisation in IIT (Bombay) Library. Circulation, being a major and most difficult activity that takes place on a large scale in library dealing with all the users, has a high visibility factor. Computerisation of this activity will have immediate impact on the users, as the benefits of automation will be immediately transferred to the users.
Singh, S. N and Singh, U. N. (2001) did a comprehensive study of relevant issues of bar code technology for library automation. They consider the meaning, objectives, technical implications and symbolism of barcoding. They consider issues preceding the introduction of the technology, explains the procedures and strategies for the generation of barcode labels and application of the technology to library circulation control systems.

Majumdar and Singh (2004) intend to highlight a circulation module which is a subset of Integrated Library Management System. Open Industry-standard, Scalable, Modular, Web-enabled, Comprehensive - these are the hallmarks of an effective integrated library system.

2.3.5 On-line Public Access Catalogue (OPAC)

The computerised on-line catalogue is popularly known as Online Public Access Catalogue (OPAC). The OPAC is a computerised database of the library holdings, which can be searched in more powerful ways than manual card catalogue. The OPAC can be searched locally, online through networks and Internet.

Rowley (1993: 247) states that OPAC supports more sophisticated searching and allows consultation of issued records as well as on-order items. Its features include combined searches using Boolean operators and nested terms, field searches, range searches, relational searches, hyper searches, qualifying searches, group search, storable and reusable search strategies and search results. It also offers powerful sorting capabilities and printing options. Other features include a number of ways of displaying search results, access from remote locations, searches statistics, generation of hardcopy catalogues and creation of catalogue on CD-ROM.
Aruna (1998) states that an increasing number of libraries now make their catalogues available online through online public access catalogues (OPACs), which can be searched from a terminal within the originating library, from a terminal elsewhere in the organization, or remotely via national or international telecommunications networks. The author discusses the impact of an OPAC on library automation, different types of OPACs, how to search OPACs in different ways, and the limitations of OPACs. Also the author evaluates the OPAC module of the SUCHIKA software.

Ramesh Babu and Ann O'Brien (2000) reports that web-based online public access catalogues (OPACs) began to appear in the late 1990s and many libraries are currently considering implementation. As catalogues, they demonstrate advances on traditional OPACs, especially in terms of remote access by users and their potential to integrate many document types and sources via a single interface. Six popular Web OPAC interfaces which are in use in UK academic libraries (Talis, INNOPAC, WebCat, Voyager, GeoWeb and ALEPH) have been examined with an overview of the functions offered via those interfaces. A checklist has been developed as an indicator of the important features and functions offered.

Ramesh Babu and Tamizhchelvan (2003) describes the results of a research survey conducted which examines the features provided in online public access catalogues (OPACs) in Tamil Nadu.

2.3.6 Services

Libraries are experiencing a significant impact of IT on information processing, sources and services. Rapid technological developments have enabled libraries not only to improve the quality of existing services - but also to
offer a wide range of new services to users. An automated library provides the following services - Interlibrary Loan Service (ILL), Document Delivery Service (DDS), Web access, Current Awareness Service (CAS), Selective Dissemination of Information Service (SDI), Listings Service/Notification of new materials, Routing of Journal, Table of Contents Service, Bibliographical Enquiry Service, Library reference service by E-mail, etc.

Libraries use IT to create in-house databases of their holdings. Computerised databases provide easy and user-friendly access to the information resources and sound foundation for efficient information services. One of the fundamental characteristics of computer based information retrieval is that the database at the heart of the system may be used as the basis for a plethora of different products ranging from CD-ROM, through online access on an external host to printed indexes and current awareness bulletins (Rowley, 1993:115).

Porat (2001) emphasises the growing need for libraries to minimise expenses, and says that the reduction in the number of labour-intensive tasks has prompted the ILL unit of the library at the University of Haifa in Israel to undertake a systematic process of automation. The author describes the process and development of this automation and assesses the extent to which it has improved customer service.

Bailey (2004) explores that library and information managers are now under more pressure than ever to deliver cost effective information and services to their clients. Library automation is a vital tool in the push to work smarter and work better. Clear trends are emerging as managers are seeking library software which not only runs the library effectively, but also uses Internet technology, interacts with other applications and data, and provides sophisticated
intelligence. Library and information managers are also demanding the integration of the library system with other applications.

Sani and Tiamiyu (2005) have evaluated the status of automated information services in selected Nigerian universities through site visits, and questionnaire and interview surveys of the views of administrators, teaching/non-teaching staff, students and researchers. It was found that automated services were far from adequate and that, out of the 29 different automated services that one would expect in a modern university, only about 40 per cent were available and utilized. Respondents were marginally satisfied with the services of the computerized accounting system and the MIS-related databases, but were very dissatisfied with the level of automated library services.

Rokade and Rajyalakshmi (2005) describe the present condition of information services in agricultural university libraries in Maharashtra, India. The description changes the scenario of information services as well as their needs to develop agriculture, agricultural education, and research. Surveys are conducted on the information services of four agricultural university libraries. The results show that most university libraries provide information services free of cost which will not be affordable in the future due to high cost of Internet, electronic journals, and prices of books. Based on this study, the authors conclude that it is essential to develop computerized and digitalized information services through the development of financial and human resources.

2.3.7 Administration, Management Information and Maintenance

In today's library environment of decreasing budgets and increasing accountability and demands, library managers are called upon to monitor the functioning of the library regularly to assess the efficiency of library operations
in making decisions about changes in the way library functions. A computerised library system provides comprehensive, reliable, relevant, up-to-date and specific information useful to the management quickly on various library activities required by the management for taking effective decisions.

Data migration is considered to be the most problematic aspect of the change over of a library management system, especially for libraries switching from a first generation system to a new system. The problem is compounded in developing countries where libraries lack both skilled manpower and financial resources (Hallmark and Garcia, 1992).

According to Hamilton (1995), systems migration is a massive project that requires extensive planning, careful scheduling, and having local technical expertise. Hamilton identifies a number of factors that have to be taken into consideration when implementing systems migration and these include site preparation, data preparation for transfer from the old to the new system, outlining the schedule of work and estimating downtime, training the staff, and working closely with the systems vendor for some time.

Copeland, Farmer and Smith (1997) make useful suggestions for analysing and handling data and documenting the process. Vendors can be assisted with data migration, but it is important for both parties to spell out in the contract what they will, and will not, do.

Dixon (2000) discusses the need for management statistics and cites Florida's College Center for Library Automation as an example of how library management statistics are generated and utilised from an integrated library system (ILS). Regardless of the size of the library, or the ILS in use, the primary
factor in utilising the statistics is the consistency of extraction and the comparability of the figures.

Khurshid and Kadry (2005) reports the experiences in data migration of the KFUPM Library with libraries planning to move from legacy systems such as DOBIS/LIBIS to third-generation systems. A detailed analysis of DOBIS/LIBIS data structure, data extraction, including data mining, and data conversion of bibliographic, non-bibliographic and bilingual data was carried out to provide maximum information to libraries about the complexities of source data and how to overcome them. The majority of the problems came from the lack of full MARC support in DOBIS/LIBIS and because of some local practices.

Nfila, Dintwe and Rao (2005) report their experiences of the University of Botswana Library (UBL) in migrating from the TINLIB to Innopac library automation systems. The authors discuss various steps involved in system migration at UBL. They indicate data conversion steps used for both TINLIB and CDS/ISIS data and various problems encountered in translating non-MARC data into USMARC.

Skretas (2005) provided a general list of factors that affect and determine the full use of library information management systems (LIMS) by library staff. The factors, which were identified mainly during participation in the implementation of automation projects in Greece, are listed and briefly analysed in categories relevant to the system aspect and to the library aspect. A balanced coverage of all factors should guide us towards a full use of an LIMS. Certainly, in the cases where detailed documentation is needed, this approach is not enough, but as a starting-point it might be useful.
2.3.8 Impact of IT on Human Resource

Human resources are the key to the successful use of any technology in a library. The greatest challenge faced in the deployment of IT is the development of skilled human resources. The staff who can support and comply with the computer and network environment is essential for effective IT implementation. Positive attitudes and actions of staff involved in IT use are regarded as crucial for the successful implementation of a new system. Information technology has created a sense of urgency and has created new possibilities for librarianship. Librarians, along with traditional and basic knowledge of librarianship are also required to be well equipped with the knowledge of computer applications in libraries.

Klerk and Euster (1989) also found that there were fewer professionals working in technical services because of the changes in the cataloguing process and that, at the same time, automation has caused an increased demand on the public service area, where professional librarians now spend more of their time. This is changing the orientation of the library from a warehouse to a client-centred approach.

Dyer, Fossey and McKeel (1993) state that technology can have a profound effect on job design and the quality of working life. The introduction of an automated library system brings about changes in the working environment, in the nature of the work and job content, in job autonomy and methods of control, in skill requirements, responsibility, status and career paths and in patterns of relationships, work groups and communication.

Vijaykumar (1995) has conducted a research to study professional attitude towards library computerisation in university and special libraries in
Andhra Pradesh. He focuses his attention on their changing roles amidst new challenges and opportunities that IT offers.

Aina (2002) discusses the performance appraisal of library staff in the context of the change from manual operation to library automation in academic libraries in Nigeria. The author mentions that opinion on the impact of automation on their performances were obtained through their reactions to some statements using a scale that was provided in the questionnaire. The general belief is that: library staff productivity has been improved, that there has been a change in users' attitudes towards librarians and that the automation of their libraries is of very great significance though there are bound to be trials and tribulations of the start of the automation.

Hoskins (2005) has in a survey investigated the ICT knowledge and skills of subject librarians at the university libraries of KwaZulu-Natal. A study population of 43 subject librarians, in the university libraries of the Universities of Durban-Westville, Natal (Durban and Pietermaritzburg), and Zululand were surveyed by means of a mailed questionnaire. Interpretation of the results have revealed a low level of ICT knowledge and skill amongst subject librarians and a general lack of formal training for ICTs amongst the subject librarians.

2.4 Trends in Integrated Library Software

The library and information sector is in the midst of an era of rapid change. Developments in technology and the associated social changes are at once presenting new challenges and opening new possibilities. Until recently "automated library systems" meant computerising traditional library functions such as circulation, cataloguing, the online public catalogue, acquisitions, and serials check-in, with the library's database as the core element. The recent and
rapid evolution in the past few years of libraries, ILMS vendors and integrated library systems themselves now presents some interesting challenges. With the growing capabilities of today’s technological advances in the use of web, digital components and electronic resources the expectations of the users have also increased.

Patel and Bhargava (1995) highlight the present Indian scenario of library automation and present a brief overview of some existing software available in the Indian market. They discuss in brief the framework, text retrieval and library management features available with these packages and also the pros and cons of various software and their implications in the library environment. A brief outline of the modules and sub-modules of some prominent library software is also given.

Breeding (1998) has presented a synopsis of individual vendors and reviewed some of the major industry trends that are apparent in the library automation arena. Many vendors have been working intensely on developing next-generation systems, designed to replace the host-based systems that dominated the market for large libraries until about five years ago. When Client/server, object-oriented and open systems concepts became the buzzwords of the industry.

Chaudhaery and Ashoor (1998) provide functional performance data drawn from an analysis of the capabilities and functionality of three major library automation systems – HORIZON, INNOPAC and VTLS. The assessment was based on vendor input as well as on feedback from libraries of different types from different parts of the world. Objective criteria based on a numerical scoring scheme was used to assess system performance in six major functional
areas: acquisition, cataloguing, circulation, public access catalogue, reference and information services and serials control. The functional performance data is expected to be useful for libraries looking for new systems as well as those already computerised and interested in enhancing their present systems. In addition, data on the extent of the utilisation of system capabilities by libraries should also be of interest to system vendors.

Cibbarelli (1998) provides a reality check on the level of developments in library automation systems for the period 1993-1998. In reality, library automation software publishers continue to evolve their products to take advantage of emerging technologies, and librarians' expectations are evolving just as quickly. The focus of product development in library automation firms for the last five years (1993-98) has been towards developing interfaces: Web based interfaces to the Online catalog, Technical Processing, Acquisitions, Serials, and Cataloging; telnet access to the online catalog; graphical user interfaces; and interfaces to other vendors' products. Product migration has been to Unix, Windows NT and Windows 95 operating systems.

Ravichandra Rao and Abideen (1999) discuss the need for library automation and offer an overview of the features and functions of library automation software. They look at additional features required in the context of the Internet and discuss the need for evaluation, and factors to be considered in this process. Also they present a checklist for evaluation and selection, and comparative tables of selected software packages.

Manifold (2000) says that nothing can guarantee that an automated system selection process will be successful, but adherence to a set of common-sense principles can help in securing a successful outcome. The focus of the
process has to be on the long term and must take account of the institutional context into which the system will fit. With the shift towards user empowerment, the involvement of users in the selection process is becoming increasingly critical.

Breeding (2002a) considers the possible impact of open source software (OSS) on the library automation industry and OSS' potential to effect radical changes in libraries should it produce an integrated library system (ILS) that earns a level of acceptance on the same order that Apache did in the World Wide Web server market. Like Apache, an open source ILS would have to offer top-of-the-line features and performance to gain acceptance over its commercial rivals. The author concludes that Linux and Apache represent a worldwide victory over high-powered commercial opponents in the operating system and Web server arenas but such victories of OSS over commercial products in the ILS arena are not to be expected.

Breeding (2002b) presents the results of a survey of the library automated system marketplace in 2001. The responses from 32 vendors are analysed and the results tabulated to show global system sales by company, system, number of new and existing contracts, and US and non-US sales; market sector percentages by library type; number of installations by vendor, system and library type; and number of sales to consortia. One major trend was the expansion of the web OPAC to employ more content components and to expand the library services and options it offers. Other developments included more involvement in wireless and hand-to-hand technologies for library automation and products based on the Open Archives Initiative (OAI).
Ebenezer (2002) provides an overview of the present state of development of integrated library systems and identifies, describes and evaluates significant trends in the industry in relation to their context within the overall development of library services. He notes that the library systems market, and developments in library systems, are driven by Internet trends and by the software industry rather than by the library and information community and that they are subject to global economic imperatives.

Matoria and Upadhayay (2002) state that a number of ready-made library automation software packages are available in the market, but many of them lack Web interfaces, and thus do not provide Web-based library database access (e.g., for the OPAC). Moreover, these commercial packages provide less flexibility to librarians who want to make changes to the existing databases, and also to publish the same on the Web. Thus, the designing of in-house databases in libraries using common relational database tools (RDBMS) such as MS Access, SQL, DB2, etc. as back-end solutions represents an area of deep concern.

Sonker and Jayakanth (2003) state that to automate library services efficiently and effectively one needs an integrated library automation package. There are several commercial library automation packages now available but the costs of these packages are beyond the reach of most of the libraries especially the school and college libraries. Koha is the first open source library automation package. They have briefly discussed different features related to routine housekeeping operations that are supported by Koha.

Felstead (2004) has made a survey of the literature on integrated library management systems published between 1999 and 2003, with a bias towards the
academic market in the UK and North America. Recent trends in the integrated library management systems such as Interlibrary loan (ILL) modules integrated into the circulation system; E-checkin of serials using an “Electronic Packing Slip” (EPS); Computer-integrated telephony for sending reminders and information on reservations to users; RFID (Radio Frequency Identification) technology for stock checking, circulation and security systems; Access to OPACs, including both searching and patron functions, via mobile devices such as wireless PDAs are noted and predictions for their future identified in the literature, are described. The author concludes that the growth of Web services may enable a new approach to the procurement of library management systems.

Dietz and Grant (2005) discuss how libraries and vendors can work together to offer the best information for consumers. Further they report that innovations from Google and Amazon are clear wake-up calls that both as a profession and as an industry things need to be done differently. The authors state that library systems must no longer solely deal with the internal flows of cataloging, circulation, acquisitions, serials, and OPACs but must rather be compatible with other internal systems and, more important, external systems.

Breeding (2005a) discusses trends in five areas relating to the software developed for libraries, and based on these trends, the author's predictions for developments that might play out in the next few years. The author's predictions, based on his own empirical observations, include: (1) the integrated library system (ILS) will be reintegrated; (2) the business landscape will change; (3) players in broader industries will get involved; (4) libraries will consolidate automation efforts; and (5) commercial systems will continue to dominate.
Pace (2005) presents a buyer's guide to integrated library systems. Based on the response of survey respondents, a cost basis for a system is categorized generally as follows: number of volumes in the collection; size of the library; number of locations; number of concurrent or simultaneous users; and site license. Contributing factors include annual circulation, library type, and country, as well as a la carte items, such as training, implementation, or customized services tailored for individual contracts.

Murray (2006) states that the role of the integrated library system is, and always has been, to help manage the effective delivery of library services. This has traditionally been anchored on the management of the catalogue and physical collection. The core business and service model could be described as 'Acquire - Catalogue - Circulate'. Libraries today present a more holistic information environment; the role of library systems therefore is to make the management and delivery of that environment both effective and efficient. The business and service model is evolving from acquiring, cataloguing and circulating physical collections to synthesising, specialising and mobilising Web-based services. The current generation of federated search systems, link resolvers, resource-sharing systems and electronic record management (ERM) systems have begun to address the new model.

2.5 Conclusion

The studies cited in the literature review indicate that considerable work has been done in studying the application of information technology in libraries, library automation, integrated library systems and impact of IT on human resources in general. However, there is a dearth of literature that deals specifically with the study of level of usage of integrated library software in the
university libraries in India. The trend is gradually changing. With the advent of personal computers and comprehensive software packages many university libraries are trying to automate as many as areas possible. Increasing importance of library automation, resource sharing and activities of INFLIBNET Centre are providing the much needed impetus for the university libraries. However, the research is still in the formative stage and it needs to be taken further to achieve the very objective of studying the level of use of Integrated Library Software in University libraries.
References


