CHAPTER 7

QUANTUM OF STAFF FOR
ACADEMIC LIBRARIES OF ORISSA

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7.1 EXISTING NORMS AT NATIONAL AND STATE LEVEL

A number of staffing patterns, both at national and state levels have been formulated for university libraries. At national level, the important ones are Ranganathan’s staff formula formulated by Dr. S.R. Ranganathan in the year 1959, University Grants Commission (UGC) staffing pattern formulated by different committees and commissions at different times. Besides this many state governments have also formulated different staffing patterns for the academic libraries. Some are discussed below.

7.1.1 Ranganathan's staff formula

Dr. S.R. Ranganathan has recommended the following staff formula for libraries:

"(a) Professional staff = \( SB + SC + SL + SM + SP + SR + ST \)
(b) Non-professional skill staff = \( \frac{B}{30,000} + \frac{S}{100} \)
(c) Unskilled staff

\[
= \frac{SB}{4} + \frac{SC}{2} + \frac{SL}{4} + \frac{SM}{2} + \frac{SP}{8} + \frac{SR}{20,000} + \frac{A}{500} + \frac{D}{60,000} + \frac{B}{4} + \frac{(S/100)}{30,000} \]

Explanation of the Staff Formula

SB = Number of persons in book section

\[
= \frac{A}{6,000} = \frac{Number of books accessioned in a year}{6000}
\]

It means for book section, one person is required for accessioning 6000 books in a year.

SC = Number of persons in circulation section.

\[
= \frac{G}{1500} = \frac{Number of gate hours for a year}{1500}
\]
It means for circulation section, one person is required for 1500 gate hours. One gate hour means one counter gate kept open for one hour.

\[
SL = \frac{HW}{1500} = \frac{\text{Number of hours library is kept open in day } X \times \text{Number of working days in a year}}{1500}
\]

It means one person is required as librarian or his deputies for 1500 working hours in a year.

\[
SM = \frac{A}{3000} = \frac{\text{Number of volumes accessioned in a year}}{3000}
\]

It means one person is required for shelving and repairing of 3000 volumes in a year.

\[
SP = \frac{P}{500} = \frac{\text{Number of periodicals currently taken}}{500}
\]

It means for periodical section one person is required for acquiring and recording 500 periodicals in a year.

\[
SR = \frac{R \times W}{50 \times 250} = \frac{\text{Number of readers per day} \times \text{Number of working days in a year}}{50 \times 250}
\]

It means for reference section one person is required for 50 readers per day.
ST = Number of persons in technical section (i.e. classification and cataloguing).

\[ ST = \frac{A + 40D}{2000} \]

It means for technical section, one person is required for classification and cataloguing of documents and abstracting and indexing of 8 books or articles per day on average basic. Here

- B = Number of readers per day
- S = Number of seats for readers
- A = Number of volumes accessioned in a year
- D = Number of periodicals abstracted and indexed in a year
- V = Number of volumes in the library.

The formula of Dr. S.R. Ranganathan is based on assumption and has been formulated on the basis of experience. However, this formula, according to Ranganathan can be applied to all kinds of libraries with minor modifications.

7.1.2 University Grants Commission staff formula (1957)

The Library Committee of University Grants Commission (U.G.C.) formulated a staff formula to lay down the strength of staff in various sections of a library, under the Chairmanship of Dr. S.R. Ranganathan in the year 1957. The staff formula was meant for University and college libraries and are discussed as below.

"Professional Skilled Staff"

1. Book Section - One person for every 6000 volumes added in a year.
2. Periodical section - One person for every 500 current periodicals subscribed.

3. Documentation Section - One person for every 1000 entries prepared in a year.

4. Technical Section - One person for every 2000 volumes added in a year.

5. Maintenance Section - One person for every 6000 volumes added in a year, one person for every 500 volumes to be replaced in a day and one person for every 100000 volumes in the library.

6. Publicity Section - No staff provided for this section

7. Administrative Section - Minimum of one library accountant, one Stenotypist and one Correspondence clerk.

8. Reference Section - One person for every 50 readers (other than the users of the text book collection) in a day.

9. Circulation Section - One person for every 1500 gate hours in a year.

10. Supervisory Section - One Librarian and one Assistant or Deputy Librarian.

**Unskilled Staff**

One cleaner for every 30,000 volumes in the library, one attendant each for every 6,000 volumes added in a year, for every 500 current periodicals taken, and for each of the shifts in the circulation section, besides unskilled and semi-skilled workers normal to any institution.

Later on, Dr. Ranganathan himself suggested the following changes in the above staff formula.

2. Periodical section - One person for every 1,500 periodicals subscribed.

3. Documentation section - One person for 50 research workers.
5. Maintenance section - One person for 1,500 volumes newly added in a year and 50,000 volumes to be looked after.

7.1.3 University Grant Commission staff pattern (1979)

A workshop was organised by University Grant Commission on formulating standards for college libraries at Khandala from March 5 to 7, 1979. The recommendations made by this workshop were subsequently approved by the UGC sub-committee at its meeting held on August 30, 1979. The recommendations made regarding the strength of library staff are as given below.

For a Student Enrolment upto 500 and Number of Volumes 5000

The basic staff strength recommended as

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Post</th>
<th>No. of Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Librarian</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Asst. Librarian</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Library Assistant</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Library Clerk-cum-typist</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Library Attendant</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

In addition to above recommendations, the following staff are also suggested to keep pace with the growth in the library collection and increase in membership.

(i) For an increase of every 500 students:- One library assistant and two library attendants should be added.
(ii) For every addition of 25,000 volumes up to the limit of 80,000 volumes:- One library assistant and two library attendants should be added.

(iii) When the strength of students exceed 2000:- One more Assistant Librarian and one Library clerk should be appointed.

The figures mentioned above are based on the following tentative framework of the main functions that are expected to be carried out in the college library.

a) acquisition of new books
b) acquisition of periodicals and their control
c) technical processing service
d) reference service
e) circulation service
f) maintenance
g) administration
h) supervisory work and
i) documentation

7.1.4 Library staff pattern accepted by different universities and state governments

Besides the above mentioned National Staff pattern for academic libraries, many Universities and state governments have also formulated their library staff pattern for academic libraries under the university and state respectively. Some of the staff pattern are as given below.

Delhi University Colleges

In Delhi University day college libraries, the following staff has been sanctioned by UGC (vide Letter No.F.1-18/63 (CUP) of 25.9.1964 and letter No. F.1-35/47(CU) of 18.2.1968\textsuperscript{5}.}
<table>
<thead>
<tr>
<th>Number</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Librarian</td>
</tr>
<tr>
<td>1</td>
<td>Professional Assistant</td>
</tr>
<tr>
<td>1</td>
<td>Semi Professional Assistant</td>
</tr>
<tr>
<td>1</td>
<td>Library Assistant</td>
</tr>
<tr>
<td>1</td>
<td>Typist</td>
</tr>
<tr>
<td>2</td>
<td>Attendants (upto a collection of 1500 volumes)</td>
</tr>
</tbody>
</table>

**Note:** If the collection is upto 30,000 volumes, then 4 attendants are provided. For an extended college (having more than 1500 students), 2 additional attendants are given. In case a library opens for 12 hours, then 2 additional attendants are provided.

In Delhi University Evening Colleges, the following staff has been sanctioned.

<table>
<thead>
<tr>
<th>Number</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Librarian</td>
</tr>
<tr>
<td>1</td>
<td>Semi Professional Assistant</td>
</tr>
<tr>
<td>1</td>
<td>Typist</td>
</tr>
<tr>
<td>2</td>
<td>Attendants (upto a collection of 15000 volumes)</td>
</tr>
</tbody>
</table>

**Note:**

(i) Upto a collection of 40,000 volumes, 4 attendants are provided, 50% of the attendants are placed in the senior scale.

(ii) Logically speaking, an evening college library should have the same number and level of staff as in day colleges.

*Staff Pattern accepted by University of Pune (1979)*

Pune University arranged a workshop of Principals at Khandala, Pune in 1979 which is as follows.

---
| 1 | Less than 500 students | 1 Librarian/Asst. Librarian  
2 Library Assistant  
2 Peons |
|---|---|---|
| 2 | Between 501 to 999 students | 1 Librarian/Asst. Librarian  
2 Library Assistant  
3 Peons |
| 3 | After 1500 students | 1 additional post of Asst. Librarian |
| 4 | For every increase of 500 students or part thereof | 1 Additional post of Library Assistant and 1 Peon |
| 5 | After 2000 students | 1 Additional post of Technical Assistant |
| 6 | For every 25,000 volume increase | 1 additional post of Library Assistant and 1 Peon |

**Staff pattern in college libraries of Maharashtra**

Maharashtra State Government has given a staff formula for the library staff college libraries which is as follows.

“One person for 250 students, every 4th will be a Junior clerk, others will be Class IV staff and a post of Assistant Librarian”\(^7\).

**Staff pattern in college libraries of Kerala**

As per the Kerala Government order No.(P).934/Education, dated 31st December 1962, Arts and Science College Libraries had following staff pattern\(^8\).
Then on 31st March 1971, the Kerala Government used an order (Memorandum No.39/71/Education(f) Dept.) classifying the college libraries in the State. Accordingly the college libraries and librarians are graded into four categories on the basis of the size of book collection and volume of annual book circulation. The norms prescribed for grading the libraries and librarians are as follows.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Book Collection</th>
<th>Annual book circulation</th>
<th>No. of staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Above 15,000</td>
<td>Above 30,000</td>
<td>1 Librarian, 3 Attendant (One additional attendant for more than 20,000 collection and 40,000 books circulation per annum)</td>
</tr>
<tr>
<td>Second</td>
<td>Between 10,000 and 15,000</td>
<td>Between 20,000 and 30,000</td>
<td>1 Librarian, 2 Attendant</td>
</tr>
<tr>
<td>Third</td>
<td>Between 5000 and 10,000</td>
<td>Between 10,000 and 20,000</td>
<td>1 Librarian, 2 Attendant</td>
</tr>
<tr>
<td>Fourth</td>
<td>5,000 and below</td>
<td>10,000 and below</td>
<td>1 Librarian, 1 Attendant</td>
</tr>
</tbody>
</table>
The above mentioned staff pattern is the latest one as per Kerala Government.

**Staff pattern for college libraries of Orissa**

The State Government of Orissa has not formulated any specific staff pattern for Post-graduate and Degree College libraries of Orissa. However, in November 1994, in exercise of powers conferred by sub section (4) of section 7-c of the Orissa Education Act, the State Government formulated a staff pattern for Non-Government Colleges, Junior Colleges or Higher Secondary Schools in order to regulate payment of grant-in-aid to private educational institutions. The staff pattern is as follows:

<table>
<thead>
<tr>
<th>SN</th>
<th># of admissible Student Strength</th>
<th># of Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Upto 350</td>
<td>One Assistant Librarian</td>
</tr>
<tr>
<td>2</td>
<td>More than 350 and upto 750</td>
<td>One Assistant Librarian One Library Attendant</td>
</tr>
<tr>
<td>3</td>
<td>More than 750 and upto 1500</td>
<td>One Assistant Librarian One Library Attendant</td>
</tr>
<tr>
<td>4</td>
<td>More than 1500 and upto 2500</td>
<td>One Librarian (if no of books exceeds 10,000) One Assistant Librarian One Library Attendant</td>
</tr>
<tr>
<td>5</td>
<td>More than 2500</td>
<td>One Librarian (if no. of books exceeds 10000) Two Assistant Librarians Two Library Attendants</td>
</tr>
</tbody>
</table>

**7.2 CATEGORIES OF LIBRARY STAFF**

The efficiency and effectiveness of academic libraries largely depend on the capability or competence of the library staff and on the facilities and environment provided for their work and development. The
academic libraries are expected to provide a variety of library and information services in different subject fields and also to interact with various groups of target users like students, faculty, research scholars, staff etc. Therefore, the library staff should be professionally qualified i.e. they should have appropriate qualification in the library and information science. In addition, they should have adequate experience and training, innovative capability, proper attitude towards work so that there will be harmony among the functional sub units of libraries and also their mutual enrichment.

Regarding the categorisation of library staff, different library scientists/experts have given different views. Dr. Seetharama categories the personnel required in libraries and information centres into three types. These are professionals, semi-professionals and supporting staff. The professionals in academic libraries includes Librarian, Deputy Librarian, Assistant Librarian and Professional Assistant. These staff are involved in overall management, policy making, planning, coordination, control, leadership, external relations, information resource building, processing, reference service, information consolidation services etc. The semi-professionals includes Library Assistants, Technical Assistants, Self-Assistants, Record Assistants etc. and these staff performs jobs like book ordering, checking bibliographical details of documents, accessioning, descriptive cataloguing, charging and discharging, sending reminders for non receipt of documents etc. The supporting staff includes personnel required to handle computer, communication, media technologies, reprographies, various administrative and financial matters and performs similar job.

Similarly Krishan Kumar, divides the staff in a library into three categories such as Professional, Supporting (administrative) and Supporting (technical)/Para-professional. The Professional staff are further classified into professional senior, Professional junior and professional assistant. The jobs performed by professional staff are book selection, book order, classification, cataloguing, indexing, abstracting, reference service/information service,
planning etc. The supporting staff (Administrative) performs jobs like secretarial assistance to the librarian, maintenance of personnel records (appointments, personal files, service books, confidential records etc.), maintenance of accounts and stores (salaries of staff, purchase of stores, maintenance of both stock registers for both consumable and non consumable articles, payment of bills etc.), typing (except that of catalogue cards, bibliographies, documentation lists) or, house keeping and sanitorial duties. The supporting staff (technical) can be compared to para-medial staff of hospitals and performs jobs like preparation of book selection slips, accessioning of books, registration of periodicals, typing of catalogue cards, charging and discharging of books, maintenance of issue-records, typing of bibliographies, documentation lists, inter-library loan work, shelving of books and periodicals, preparation of books and periodicals for binding, stock-taking etc.

In the opinion of Dr. R.L. Mittal, we may classify jobs into (a) Professional, Senior and Junior (b) Semi-professional, clerical or Secretarial and (c) unskilled. Further, each of these jobs may be again divided into grades or classes.

But the classification of library staff into the above mentioned categories seems to be unrealistic. There should be only two categories of staff in an academic libraries i.e. Professional staff and Non-professional supporting staff.

(a) Professional Staff - In the changing context of the concept of libraries, libraries are no longer considered as mere store house of documents but are treated as an information service organisation. It is a service organisation which provides opportunities to acquire knowledge. More recently because of information explosion, development of technology, change of users demand, the library professionals should possess adequate knowledge on library organisation and management. Therefore, the professional staff should consist of those who possess a qualification in library and information
science in addition to general qualification. Besides this, the modern library professionals should be familiar with the computerisation and automation of libraries, library networking, information technology, information marketing and economics of information etc.

The professionals in an academic library should include Librarian, Deputy Librarian, Assistant Librarian and Professional Assistant. The professional staff should perform the following functions.

(i) Acquisition of books, periodicals and other documents.

(ii) Technical processing i.e. accessioning, classification, cataloguing of documents and other related works.

(iii) Provide information services including indexing and abstracting service etc.

(iv) Charging and discharging of documents.

(v) Implementation of information technologies and computerisation in libraries.

(vi) Handling of computers, databases, Internet, CD-Roms, Communications and media technologies to provide library and information service.

(vii) Development of database, software packages etc.

(viii) Functions related with library automation.

(ix) Design of information products.

(x) Policy making, financial planning, system analysis, their-personal relation and overall management of libraries.

Besides the routine work of academic libraries i.e. acquisition, processing, organisation and dissemination of information or information containing documents, the library personnel should also perform the jobs related with automation of library, management of different information technology products and services etc. Accordingly the course contents of the
library and information science should be structured in universities, otherwise the personnel from other professions will snatch away the bread and butter of the library professionals.

(b) Non-Professional Supporting Staff - These category of staff should possess general qualification but qualification in library and information science is not essential for them. The non-professional supporting staff should include library attendant, library clerk, personnel to handle reprographies, other menials, watchman etc. However, the library attendants should possess a library science qualification upto diploma or certificate level. Further, the technical persons to handle reprographies, electric instruments etc. should have desirable qualification in their respective fields. The non-professional supporting staff should perform the following functions.

(i) Shelving and reshelving of documents.
(ii) Pasting of book label, book packet, tag, due date slip etc.
(iii) Preparation of books and periodicals for binding.
(iv) Maintenance of sequence of books and periodical in proper place.
(v) Secretarial assistance to librarian.
(vi) Maintenance of personal records i.e. appointments, personal files, service books, confidential records, records regarding acquisition, reminders to publishers/suppliers etc.
(vii) Maintenance of accounts and stores i.e. salaries of staff, purchase of stores and supplies etc.
(viii) Maintenance and handling of reprographies such as xerox machine, microfilm/microfiche readers, printing machine etc.
(ix) General office administration and personnel administration etc.
Thus the professional staff should consist of those personnel, who possess a qualification in library and information science or equivalent and should perform all types of professional jobs, planning and formulation of policies of the library. The non-professional supporting staff should include all non-professionals and they should help the professional staff to perform their jobs and other jobs relating to office administration, financial administration, personnel administration and other office related jobs of the library.

7.3 STAFF STRUCTURE FOR ACADEMIC LIBRARIES

The staff structure of different libraries differs from one another. But the hierarchy of staff structure in academic libraries should be the same so as to maintain consistency among the library staff.

A model staff structure of professional staff of University/P.G. College library is as given below.

CHIEF LIBRARIAN

↑

DEPUTY LIBRARIAN

↑

ASSISTANT LIBRARIAN

↑

SENIOR PROFESSIONAL ASSISTANT

↑

JUNIOR PROFESSIONAL ASSISTANT

Similarly the model staff structure of professional staff of Degree College libraries is given below:

LIBRARIAN

↑

ASSISTANT LIBRARIAN

↑

PROFESSIONAL ASSISTANT
A hierarchy of professional library staff job

(a) University/P.G. College Library

<table>
<thead>
<tr>
<th>S No</th>
<th>Job Title</th>
<th>Educational Qualification</th>
<th>Experience</th>
<th>Job Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chief Librarian</td>
<td>M.Lib. &amp; Inf.Sc., Ph.D. in LIS, Diploma in IT</td>
<td>10 years in a Library of standing</td>
<td>Overall responsibility for planning, operation, and management of the library</td>
</tr>
<tr>
<td>2</td>
<td>Deputy Librarian</td>
<td>M.Lib. &amp; Inf.Sc., Ph.D. in LIS, Diploma in IT</td>
<td>5 years professional experience</td>
<td>General supervision of the works of Assistant Librarians-in charge of different sections and their operational management</td>
</tr>
<tr>
<td>3</td>
<td>Asst. Librarian</td>
<td>M.Lib. &amp; Inf.Sc., Diploma in IT</td>
<td>3 years professional experience</td>
<td>In charge of a particular section or responsibility for a unit of the library for supervision, policy development and other innovative works</td>
</tr>
<tr>
<td>4</td>
<td>Senior Professional Assistant</td>
<td>M.Lib. &amp; Inf.Sc. Knowledge of Computer operation</td>
<td>2 years professional experience</td>
<td>To assist the Asst. Librarian for framing the policies, operations and responsibility for a unit of a department of the library</td>
</tr>
<tr>
<td>5</td>
<td>Junior Professional Assistant</td>
<td>B.Lib. &amp; Inf.Sc. Knowledge of Computer operation</td>
<td>Nil</td>
<td>To assist and work in a unit under the direction of Senior Professional Assistant or Assistant Librarian</td>
</tr>
</tbody>
</table>
(b) Degree college library

<table>
<thead>
<tr>
<th>S N</th>
<th>Job Title</th>
<th>Educational Qualification</th>
<th>Experience</th>
<th>Job Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Librarian</td>
<td>M.Lib. &amp; Inf. Sc. Knowledge of Computer operation</td>
<td>3 years professional experience</td>
<td>Overall responsibility of planning, operation and management of the library</td>
</tr>
<tr>
<td>2</td>
<td>Assistant Librarian</td>
<td>B.Lib. &amp; Inf. Sc. Knowledge of Computer operation</td>
<td>Nil</td>
<td>In charge of a particular section or sections of library and to remain in-charge of Librarian during his/her absent</td>
</tr>
<tr>
<td>3</td>
<td>Professional Assistant</td>
<td>B.Lib. &amp; Inf. Sc.</td>
<td>Nil</td>
<td>To assist and work in a unit under the direction of Assistant Librarian</td>
</tr>
</tbody>
</table>

7.4 PROPOSED STAFF FORMULA FOR ACADEMIC LIBRARIES OF ORISSA

The Staff formula has been proposed basing on to the activities and functions performed by the academic libraries of Orissa, keeping in view of the future change. Further, separate staff formula have been proposed for University/P.G. College libraries and Degree college libraries, because the collection, services, number and types of users varies to a great extent in this two types of libraries.

Staff Formula for University/P.G. College Libraries

The work of an University or P.G. college library consists of procurement of different types of reading materials, its technical processing for proper organisation, different types of library services which includes C.A.S., S.D.I., bibliographic, translation, photocopy services etc. physical
maintenance of stock, building and equipments, issue and return of documents etc. Accordingly the different sections of the library are:

(a) Acquisition Section, for procurement of library materials.

(b) Processing section, for technical processing of library materials such as classification, cataloguing etc.

(c) Circulation section, for issue and return of documents.

(d) Periodical section, for circulation of different periodicals and maintenance of reading room.

(e) Text book section, for circulation of text books and maintenance of reading room.

(f) Reference Section, to provide reference services like C.A.S., S.D.I., referral service, bibliographic service etc.

(g) Maintenance Section, for physical maintenance of library stock, building and equipments.

(h) Reprographic section, for photo copy services.

(i) Administrative section, for general administration of the library.

But the present age is the age of information. Due to the technological advancement, information explosion, a large number of information containing documents are generated everyday. Keeping pace with this, users demand has also been changed from traditional books, periodicals etc. to pin-pointed information. To cope up with the changes, libraries are shifting from its traditional form to modernisation through by computerisation and networking. Therefore, in the context of change an University/P.G. college library should have following sections with their respective work to meet their users demand quickly, accurately and satisfactorily.
(i) **Information resource building section** - This section should perform the works relating to collection development and acquisition of different types of library materials including non-book and fugitive materials, budget control and maintenance of statistics.

(ii) **Lending section** - This section should perform the works relating to charging, discharging of library materials, reservation of documents, overdues, reminder and maintenance of circulation statistics.

(iii) **Document processing section** - This section should perform the works relating to technical processing i.e. accession, classification, cataloguing of library materials manually or with the help of computers. This section will prepare data files for creation of databases.

(iv) **Reading room service section** - This section should maintain the text and periodical reading room and should perform functions, such as maintenance of stock, temporary issue and return for reading rooms, overnight issue, overdue, reminders and conduct of survey to assess users needs.

(v) **Online information service section** – This section should perform functions related to organisation of non-book materials, online search, providing various information and referral services etc.

(vi) **Information products and services section** – This section should conduct surveys to assess user needs, design and prepare various information products and services and maintain statistics of this section.

(vii) **Support service section** - This section should perform the works related to translation, reprography, preparation of hard copies, microproduction, printing and maintenance of statistics of the section.

(viii) **Maintenance Section** – This section should perform works related to preservation and conservation of library documents, physical maintenance of
library building, furniture and equipment, maintenance of dead collection, binding, replacement of unused documents etc.

(ix) **Research and development section** – This section should conduct surveys to assess the needs and expectations of users, prepare various problem solving devices, design methods for overall budget control of the library, resource building and optimum use of library materials, design innovative programs for library.

(x) **General administration section** – This section should perform works related to recruitment, placement, in-service training, motivation duty allocation of library staff. Besides, it should perform works related to budget allocation to different departments of the library, utilisation of budget, bills, payment to book publishers or vendors etc.

In this proposed staff formula for University/P.G. College libraries, personnel norms have been worked out taking a standard model university library condition, discharging the above mentioned library functions and the personnel required to accomplish these functions efficiently. Based on this, a work to staff relationship constant (K) has been derived which can be applied to estimate the professional human resource requirement for the University/P.G. College libraries.

To calculate the value of work to staff relationship constant (K), the standard workload (W) and Human Resource i.e. manpower (M) of a model university library conditions have been taken, which is considered adequate in quality and quantity on the basis of consensus. The data for the model University/P.G. college library conditions have been taken on the basis of a study of Sambalpur University, Utkal University, Berhampur University and the P.G. College libraries of Orissa, carried out by the research scholar.

The workload and manpower requirement of a model University/P.G. college library is as given below.
WORKLOAD (W)

S = Total stock of the library including books, bound volumes of periodicals etc
1,00,000

P = Periodical subscribed (both Indian and Foreign) 250 per month

T = Thesis, Reports, Databases, CD-ROMS held by the Library 5000

U = Users of the library 4000

s = Books added per year 2000

p = Bound periodicals added per year 250

t = Thesis, Reports, Databases, CD-ROMS added per year 100

PROFESSIONAL MANPOWER REQUIRED (M)

As per the above mentioned assumed work and sections of a model University/P.G. College library, let the professional manpower of different grade be 10, basing on the assumption that each section has at least one professional staff.

WORK NORM

D = Work days per person per year: Here it has been taken as 300 days. However, it is highly suggested that the working days of library staff may be increased, considering the fact that University/P.G. College library should be opened for maximum days in a year.

H = Productive work hours per day per person: Here it has been taken as 6 hours per day. This is meant for the library which opens for a single shift.
Now the work to staff relationship constant can be obtained by dividing the total work involved by the efforts required to accomplish it. The staff formula is as explained below.

Work load \((W)\) \(\propto\) Efforts required \((E)\)

or \(W = KE\)

where \(W = \text{Work load per year}\)

\(E = \text{Professional manpower required (M) X Work days per person per year (D) X productive work hours per person per day (H)}\).

\(K = \text{Constant}\)

or \(K = \frac{W}{E}\)

\[= \frac{S + 10P* + T + 25U** + s + p + t}{M \times D \times H}\]

\(*\) It is assumed that periodicals have an average 10 issue per year

\(**\) It is assumed that a user has an average of 25 interaction with the library per year including data base search, online search etc.

If we will substitute the data of model University/P.G. college library to the above formula, we will get the value of \((K)\), which is as follows:

\[K = \frac{100000 + (10 \times 250) + 5000 + (25 \times 4000) + 2000 + 250 + 100}{10 \times 300 \times 6}\]

\[= \frac{209850}{18000} = 11 \text{ (approximately)}\]

Now, transferring \(M\) and \(K\), we will get

\[M = \frac{W}{K \times D \times H}\]
Thus, as per this staff formula, the number of professional staff required for the above mentioned model University/P.G. college library is 10. Further the value of staff relationship constant (K) of this model library, can be used to calculate the required number of professional staff for other University/P.G. college libraries, taking their work load.

Staff Formula for Degree College Libraries

According to the works and services of degree college libraries and with the changing situation of academic libraries in terms of collection, services and users, a degree college library should have following sections.

(i) Administrative section - This section should perform the functions of sections like general administration, information resource building, maintenance as described previously. This section should also include Research & Development section and should be headed by the Librarian.

(ii) Lending section

(iii) On-line information service section

(iv) Reading room service section

(v) Information products and service section

(vi) Support service section

The above mentioned sections of a model Degree college library should perform the similar functions as described earlier in case of a model University/P.G. College library.

For the proposed staff formula for Degree College library, the value of work to staff relationship constant (K) should be derived taking a standard Degree college library situation in a similar way as it was derived in case of University/P.G. College Library.
The work load and manpower requirement of a model Degree College library has been taken on the basis of a study carried out by the research scholar. It is as given below.

**WORKLOAD (W)**

\[ S = \text{Total stock of the library including books, bound volumes of periodicals etc} \]

\[ P = \text{Periodical subscribed (both Indian and Foreign) 50 per month} \]

\[ T = \text{Thesis, Reports, Databases, CD-ROMS held by the Library} \]

\[ U = \text{Users of the library} \]

\[ s = \text{Books added per year} \]

\[ p = \text{Bound periodicals added per year} \]

\[ t = \text{Thesis, Reports, Databases, CD-ROMS added per year} \]

**PROFESSIONAL MANPOWER REQUIRED (M)**

As per the above mentioned assumed works and sections of a model Degree College library, let the professional manpower of different grade be 6, basing on the assumption that each section has at least one professional staff.

**WORK NORM**

\[ D = \text{Work days per person per year: Here it has been taken as 250 days.} \]

\[ H = \text{Productive work hours per person per day = 6 hours.} \]

Now substituting these data, we can calculate the value of work to staff relationship constant \((K)\)
\[
K = \frac{\text{Work load (W)}}{\text{Efforts required (E)}} = \frac{W}{M \times D \times H}
\]

\[
= \frac{20000 + (10 \times 50) + 1000 + (25 \times 2000) + 500 + 50 + 25}{6 \times 250 \times 6}
\]

\[
= \frac{72075}{9000} = 8 \text{ (approximately)}
\]

Now, transferring M and K, we will get

\[
\text{Professional Manpower Required (M)} = \frac{W}{K \times D \times H}
\]

\[
= \frac{72075}{8 \times 250 \times 6} = \frac{72075}{12000} = 6 \text{ (approximately)}
\]

Thus for the above mentioned model degree college library situation, the minimum number of professional staff required is 6. Further, the value of (K) of model degree college library can be used to calculate the number of professional staff required for other degree college libraries.

The above mentioned staff formulas (both for University/P.G. college libraries and Degree college libraries) are meant for calculation of professional staff only. The non-professional supporting staff should be recruited according to the need. Besides this, the staff formula is meant for the library which opens for a single shift. But it is highly desirable that University and P.G. College libraries should open for atleast 12 hours a day i.e. they should function in double shifts. In such cases additional professional staff should be appointed for all sections except Information resource building section, General administration section, Preservation and Maintenance section and R&D section.
7.5 HUMAN RESOURCE PLANNING IN THE CONTEXT OF EMERGING INFORMATION TECHNOLOGY

Information is the most important resource of any library. Information dissemination, transfer and communication take place in a variety of environment, between classified people and through diversified media. Thus information is a vital resource and essential ingredient in decision making. We are now in an age of information management. New researches generate huge amount of information in every discipline. Just a decade back the amount of new information generated used to double in every ten years and now it doubles in every five years and that too is fast coming down and down day by day. Searching and collecting of information has become a very difficult task for any library. Therefore, to collect, store, retrieve and disseminate information, new technologies have a considerable impact, which is dominating every sphere of human activity. Information explosion, a recent past phenomenon has created problems for proper processing and dissemination of information which can be solved with the help of newly developing technologies. Broadly, information technology (IT) is the fusion of information science and technology. It facilitates collection, storage, organisation, processing, analysis, presentation, communication and dissemination of data and information using mechanical and electronic means like computer, telecommunication and reprography. According to Baba, “IT is the combination of four important disciplines. They are information science, computer technology, communication technology and management science”\textsuperscript{10}.

7.5.1 Information technology

Information Technology is a generic term used to all activities connected with computer based processing, storage and transfer of information. It involves computers, electronic media, satellite, telecommunications and various devices. In the opinion of Rowley Information Technology is “the application of various technologies for the acquisition, processing, storage and dissemination of
information. The term ‘various technologies’ includes microelectronic based computers, telecommunications, reprography, printing etc."\textsuperscript{11}

Similarly, Sinha has defined Information Technology as “basically information technology connotes an ensemble of technologies i.e. the trinity of computer, telecommunication and microelectronics"\textsuperscript{12}.

Most recently Murthy was in the opinion that “information technology has been given different connotations by people belonging to different disciplines and specialisations. The computer and telecommunication specialists connote IT as a specialisation covering the technologies of computers and telecommunications aspects. In the field of journalism, IT is generally meant a technology used for information dissemination which includes systems like telex, fax, teleprinter, e-mail and so on. For a librarian, IT has a much wider connotation which includes the technologies and systems like microfilms, microfiche, CD-ROMs, computers, information network etc."\textsuperscript{13}

Thus, information technology can be defined as the various means of obtaining, storing and transferring information using computers, telecommunications and microelectronics.

7.5.2 Objectives of Information Technology

In the context of library and information science, the main objectives of information technology in libraries are:

(a) to support technical functions of libraries associated with technical processing and circulation of documents.
(b) to support information storage, retrieval and dissemination systems.
(c) to support different library management functions and management of information services.
(d) to support in-service and orientation courses, continuing education for library professionals, library extension services etc.
(e) to bring efficiency and accuracy in all sorts of library work in a less time than manual system.

7.5.3 Features of Information Technology

The main features of information technology can be summarised as follows:

(i) Faster and cheaper computer processing which leads to library automation.
(ii) Cheaper and larger capacity of data storage media.
(iii) Faster transmission of different type of data i.e. text, graphics, sound etc.
(iv) Accuracy in data transmission.
(v) Better and effective data transfer between different systems and media, which has facilitated resource sharing among libraries.
(vi) Improved telecommunication technology which has facilitated new telecommunication services like Electronic Mail, FAX etc.
(vii) User friendly system which promotes better interface between technology and endusers.
(viii) Improvement in computer hardware and software which has increased efficiency in performance.

7.5.4 Components of Information Technology

Information technology is an union of a group of technologies. The major technologies which are most relevant for application in modern library and information systems are:

(a) Input/output devices, memory and processor.
(b) Type of computer i.e. mini, micro or large scale computers.
(c) Information storage technologies.
(d) data communication, networking and distributed processing.
(e) data entry, display respond and
(f) library software.

These technologies can also be arranged in following four major groups. These are:

(a) **Computer technology** - Computer technology has undergone tremendous changes both in its hardware and processing capabilities. Accordingly, from the genesis of computers, many generations of computers such as first, second, third, fourth and fifth generations have been evolved. Computer technology was established for the first time in Indian Statistical Institute, Calcutta in 1956. Since then computers started progressing in a big way on the Indian scene. The computers currently available are classified as personal microcomputers, super microcomputers, large computers and super computers. The available microcomputers are classified into three types is IBM-PC, IBM-PC XT and IBM-PC/AT.

The introduction of computers has revolutionalised information management by bringing speed, accuracy and effectiveness. The impact of this technology has also effected all sectors of library and information works and services. A good number of libraries in India have already started using this technology for different systems like acquisition, classification, cataloguing, indexing, circulation, stock taking, periodical control, CAS, SDI etc.

(b) **Telecommunication Technology** - Telecommunication technology came to India with the arrival of telephone in 1882 with the establishment of Telephone Exchange in Bombay, Calcutta and Madras. Telecommunication Technology refers to the transmission of data in the form of electronic signals and to the hardware, software and the procedures that make it possible. Communication is a two way process. When two computers are connected for the transmission of data, the process is called data communication. This process permits a direct,
interactive bond between the people of different workstations and the central processing systems. When the computers are communicated over telephone, the process is known as telecommunication. Thus, the main purpose of telecommunication technology is to transmit information in the form of signals between remote locations, using electrical or electromagnetic media as carriers of signals. Data transmission can be made with the helps of three types of equipments such as Terminals, MODEMS and Multiplexers, which bridge different operating environment. In recent years this technology has achieved remarkable advances. Channel capacities, reliability and error rates have also improved dramatically.

(c) Reprographic Technology - Reprographic technology refers to the supply of photocopies of documents with the help of various reprographic machines. This technology has made a big impact on the document delivery system. In recent years libraries are hard pressed for the adoption of various reprography technologies such as photocopying or xerox machine, microfilm, microfiche, audio-visual machines, etc. for space problems and also effective document delivery system.

(d) Satellite Technology - It refers to the process of transmission of information with the help of satellites. Recently satellite technology is playing an important role in the field of information. Due to this technology, various networking system like NICNET, INDONET etc. have been evolved. Thus satellite technology has revolutionised the capabilities of information technology in a long way.

7.5.5 Impact of information technology on libraries

The advent and development of information technology have given tremendous impact on library and information activities. Many types of information technologies are recently being used for different activities of libraries. Many authors have given their views on this aspect.
A.K. Sinha opines that “advances in information technology which are being utilised for library and information activities are as follows.

“(a) Computer hardware and software
(b) Storage technologies
(c) Data bases
(d) Telecommunications
(e) Information systems
(f) Microforms and Micrographies
(g) Expert systems
(h) Videotext and teletext
(i) Electronic mail”\(^{14}\).

Dr. S.S. Murthy has identifies information technologies which are relevant to libraries mainly cover the following:

“(a) Computer Technology
(b) Telecommunication Technologies
(c) Reprographic Technologies
(d) Library Technologies
(e) Technical communication”\(^{15}\).

The activities and services in libraries in which these technologies are used are indicated by him in the following figure.
Library Technologies
- Classification
- Cataloguing/Indexing
- Database creation
- CAS
- SDI

Computer Technologies
- Database organisation and management
- Library management operations

Communication Technologies
- Library networks
- Information networks

Reprographic Technologies
- Photography
- Microfilms
- Optical/Digital
- Audio/Video

Technical Communication Technologies
- Technical writing
- Editing
- Publishing

(Figure 14: Areas of IT as relevant to libraries)
7.5.6 Tools and techniques of information technology

The different tools and techniques of information technology are as follows:

(i) Mainframe computers which acts as the first information repositories.

(ii) Microcomputer, Personal computer etc.

(iii) Word processor which is embodied in PC software for word processing and Desktop publishing.

(iv) CD-ROM, Optical storage device etc. which are able to store mass volumes of text and document images.

(v) Optical Character Recognition and Intelligent Character Recognition, which convert older and incoming documents into a medium which can be understood and indexed by computers.

(vi) Optical Juke Book which can store vast image and document of libraries.

(vii) Computer Network by linking of PCs and workstations to a central machine.

(viii) Local Area Network (LAN) which links individual groups of PCs with a mini computer as a shared repository.

(ix) Wide Area Network (WAN) via satellite or landline which links users in one network with information stored on a remote machine or with users on that network.

(x) Electronic Mail systems which provides transmission of information between people efficiently.

(xi) Electronic Document Viewing Technology, by which one can eliminate paper from the equation much of the time.

(xii) Universal operating system like UNIX and Windows NT.

(xiii) PC-based user interface like Microsofts and windows.
(xiv) Text Retrieval which provides potential for content based searching of unstructured information.

(xv) Speech Recognition Technology by which data can be inputed more quickly than the keyboard.

7.5.7 Advantages of information technology

The advantages of information technology are manyfolds. These are:

(i) increase efficiency in retrieval and accuracy of information.

(ii) reduce the number of false drops considerably and improve quality of information services

(iii) increase speed of access to both retrospective and current scientific and technological data of national and international databases

(iv) reduce cost of obtaining information through online computer facilities

(v) increase storage capacity of data on microfilm, optical discs, CD-ROMs etc for future exploitation and retrieval

(vi) facilitates exhaustive information search

(vii) facilitates different areas of library automation

(viii) provides access to local and wide area networks, thus resource sharing and information dissemination among libraries and information centres are possible.

7.5.8 Library automation

Generally automation means anything which is performed automatically. In the context of library, automation refers to the processing of certain routine functions in the library with the help of computers. It includes mechanization of various processes and their operations as well as the use of machines, equipments, tools, techniques etc. In recent years many libraries are adopting information technology to automate their library.
"The computer based information Technology has effected the library and information functions in a spectacular way. The libraries and information centres in India are also influenced by the modern technology used in information handling. Computer communication based IT has a pervading influence on information handling, thus effecting the entire field of library and information science including the following activities.

- Selection and acquisition
- Processing
- Storage and maintenance
- Physical access
- Dissemination of information
- Development of information products
- Utilisation of information etc."

Several factors like information explosion, problems in acquisition, processing and storage of bulk amount of information, speed and accuracy in information dissemination, change in users demand for exhaustive and pinpointed informations etc. have led to computerisation of library operations and services.

**Prerequisite for the library automation**

Regarding the prerequisites or essential of library automation several authors have given their views.

**M.S. Deogan** has identified following factors for library computerisation.

"(i) Financial outlay for the infrastructure viz. hardware, software, installation etc.;
(ii) Selection of hardware;
(iii) Selection of software;
(iv) Development of manpower; and
(v) implementation""17.
Similarly A. Amudhavalli and M. Bavakutty have identified several prerequisites for library automation such as "cost, space, computer processing time, hardwares, softwares, personnel, planning and designing"\textsuperscript{18}.

More recently, L.S. Ramaiah has identified following essential things for the automation of a University library.

"(i) A good collection
(ii) Finances
(iii) Suitable computer Hardware
(iv) User friendly computer software
(v) Staff training
(vi) User training"\textsuperscript{19}.

The above study reveals that the essential pre-requisites for library automation are finance, computer hardware, computer software and development of manpower (includes both staff and users). These are discussed in detail as below:

(a) **Finance** - Finance is the backbone of any venture. It is the most essential and severe at constraint for any institution particularly for a non-profit service institution like academic library. Therefore, academic libraries should be provided with adequate finance by their parent bodies, government and U.G.C. for automation because cost of installation does not end with the cost of machine, but includes cabelling, terminals, infrastructures, manpower development etc. Further, this is to be followed by maintenance cost which is recurring expenditure. Therefore, before starting library automation both start up and on-going expenditure should be taken into account.

(b) **Computer Hardware** - It is a complex process to select and purchase a computer hardware. There are a number of computer manufacturers such as IBM, Macintosh, APPLE, UNIX, WIPRO, HCL, ICIM etc. and also a variety of computers starting from Miniframe computers to Mainframe computers.
Therefore, before purchasing a hardware, first library should decide what type of computer it wants for its work. For example, a big academic library should require a computer system rather than a single PC-XT because computer system have LAN, WAN facilities which facilitates E-mail and Internet. Secondly, standardization in the computer hardware is an important factor due to the fact that in recent times hardware development is very fast and market is filled with latest sophisticated machines with increased capacity at a lower cost which leads to obsolescence of the existing installation in no time. Thirdly, incompatibility is another problem posed by hardware. Hence, library should consider all merits and demerits of a computer hardware, availability of resource persons/experts for installation, maintenance, and training cost involved, etc. before purchase and installation of a hardware.

(c) Computer Software - Generally software is a package. It may be packaged software or custom designed software. There are several important agencies/institutions engaged in the development of software. Accordingly, there are many computer softwares also available for library operations. Among those softwares some are developed and marketed by government agencies and some by commercial agencies.

The major library software availables in India are shown in the following table:

<table>
<thead>
<tr>
<th>SN.</th>
<th>Software package</th>
<th>Developing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Archives (1,2,3)</td>
<td>Microfax Electronic Systems, Bombay</td>
</tr>
<tr>
<td>2</td>
<td>Acquas, Ascat, Ascir, Asire, Seras</td>
<td>Ober Information System, Calcutta</td>
</tr>
<tr>
<td>3</td>
<td>Basisplus &amp; Techlibplus</td>
<td>Information Dimension Inc(IDI), USA (Marketed in India by NIC)</td>
</tr>
<tr>
<td>4</td>
<td>Catman</td>
<td>INSDOC, New Delhi</td>
</tr>
<tr>
<td>5</td>
<td>CDS/ISIS</td>
<td>NISSAT, New Delhi</td>
</tr>
<tr>
<td>6</td>
<td>Defence Library Management System (DLMS)</td>
<td>DESIDOC, New Delhi</td>
</tr>
<tr>
<td>No.</td>
<td>Company Name</td>
<td>Details</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Golden Libra</td>
<td>Golden Age Software Technologies, Bombay</td>
</tr>
<tr>
<td>8</td>
<td>Granthalaya</td>
<td>INSDOC, New Delhi</td>
</tr>
<tr>
<td>9</td>
<td>ILMS</td>
<td>INFLIBNET Centre, Ahmedabad</td>
</tr>
<tr>
<td>10</td>
<td>Krvger Library Manager</td>
<td>Blitz, Audio Visuals, Pune</td>
</tr>
<tr>
<td>11</td>
<td>Libman</td>
<td>Datapro Consultancy Services, Pune</td>
</tr>
<tr>
<td>12</td>
<td>Libra</td>
<td>Ivy System Ltd., New Delhi</td>
</tr>
<tr>
<td>13</td>
<td>Librarian</td>
<td>Soft Aid, Pune</td>
</tr>
<tr>
<td>14</td>
<td>Library Management</td>
<td>Rachayan Sysmatics, Bangalore</td>
</tr>
<tr>
<td>15</td>
<td>Library Manager</td>
<td>System Data Control Pvt. Ltd., Bombay</td>
</tr>
<tr>
<td>16</td>
<td>Libris</td>
<td>Frontier Information Technologies Pvt. Ltd.,</td>
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<tr>
<td></td>
<td></td>
<td>Secunderabad</td>
</tr>
<tr>
<td>17</td>
<td>Lib Soft</td>
<td>ET &amp; T Corp, New Delhi</td>
</tr>
<tr>
<td>18</td>
<td>Libsys, Micro-Libsys</td>
<td>Libsys Corp, New Delhi</td>
</tr>
<tr>
<td>19</td>
<td>List Plus</td>
<td>Computer Systems, Bangalore</td>
</tr>
<tr>
<td>20</td>
<td>Loan Soft</td>
<td>Computek Computer Systems, Hyderabad</td>
</tr>
<tr>
<td>21</td>
<td>Maitrayee</td>
<td>CMC, Calcutta (for CALIBNET Project)</td>
</tr>
<tr>
<td>22</td>
<td>MECSYS</td>
<td>MECON, Ranchi</td>
</tr>
<tr>
<td>23</td>
<td>MINISIS</td>
<td>SNDT Women’s University, Mumbai</td>
</tr>
<tr>
<td>24</td>
<td>NILIS</td>
<td>Asmita Consultants, Bombay</td>
</tr>
<tr>
<td>25</td>
<td>Nirmals</td>
<td>Nirmal Institute of Computer Experts,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tiruchirapalli</td>
</tr>
<tr>
<td>26</td>
<td>OASIS</td>
<td>Soft link India, New Delhi</td>
</tr>
<tr>
<td>27</td>
<td>PALMS, CLMS</td>
<td>R.C. Prasad, GBPIHED, Almora</td>
</tr>
<tr>
<td>28</td>
<td>Salim</td>
<td>Uptron India Ltd., New Delhi</td>
</tr>
<tr>
<td>29</td>
<td>Sanjay</td>
<td>DESIDOC, Delhi (Under NISSAT Project)</td>
</tr>
<tr>
<td>30</td>
<td>Slim 1.1</td>
<td>Algorythms, Bombay</td>
</tr>
<tr>
<td>31</td>
<td>Suchika</td>
<td>DESIDOC, Delhi</td>
</tr>
<tr>
<td>32</td>
<td>Trishna</td>
<td>NISTADS, New Delhi (Under NISSAt Project)</td>
</tr>
<tr>
<td>33</td>
<td>Tulib</td>
<td>Tata Unisys Ltd., Bombay</td>
</tr>
<tr>
<td>34</td>
<td>Ulysis</td>
<td>WIPRO Information Tech. Ltd., Secunderabad</td>
</tr>
<tr>
<td>35</td>
<td>Wilisys</td>
<td>Wipro India, Bangalore</td>
</tr>
<tr>
<td>36</td>
<td>SOUL</td>
<td>INFLIBNET, Ahmedabad</td>
</tr>
</tbody>
</table>
Among all these software available, it is a complex task to select a particular software. This is because the performance of a particular software may be very good for some applications but at the same time may not be so suitable for some other application. Further, the purpose and automation programmes of libraries also differ from one another and to develop such purpose-built software is a costly affair. Therefore, the library professionals should have knowledge to make a comparative evaluation of the available software according to the requirement of the library before selecting a software. Following are some important points which should be considered before selecting a software.

(i) For implementation of a software, a suitable hardware is needed according to operating system of the software. Since availability of a suitable hardware in Indian libraries is a problem due to paucity of fund, a library should select software either according to hardware facility available in the institute or the software which requires less costly hardware. Further, operating system of software should also be selected according to the need of the library.

(ii) The environment i.e. single user environment, single user NT environment, Multi user environment on which the software is available.

(iii) The various library functions such as acquisition, cataloguing, circulation, serial control etc. can be performed by the library. Also there should be provision to check duplication of data entry in acquisition and cataloguing.

(iv) Programming language, because many facilities such as fixed field, variable field length, search facility etc. are provided in the software by using suitable programming language.

(v) Compatibility of the software to create database in standard database format like MARC, CCF etc.

(vi) Facility to transfer data in standard database format.

(vii) Facility for Internet connectivity.
(viii) Facility to handle multiple database at a time.

(ix) Facility to provide customised library services.

(x) Facility in incorporate multimedia information.

(xi) Provision for dictionaries and thesaurus for validation while selection of terms and data entry.

(xii) Search response time and Data storage techniques.

(xiii) Facility for maintenance, customisation and upgradation of software depending upon the needs of the library.

(d) Manpower - For library automation programme, development of manpower (both library staff and users) is highly essential. The library staff should be provided with adequate training on library automation with special courses on computers and automation techniques. In this regard Government, U.G.C., INFLIBNT and also professional association should take necessary steps. Further, the syllabus of the library and information science course should be developed accordingly so as to include more course on automation, computers, networking and other tools and techniques of emerging information technology. Besides, this for successful functioning of automation programme library user should also be trained through user education programmes.

Components of library automation

Library automation has mainly two components i.e. (A) Computerisation and (Bi) Networking. The library computerisation will streamline various library operations and will help to offer quick services to its users. But networking will help to access the resources of other libraries/information centres/databases. Thus the main purpose of networking is to share the resources between the participating libraries.

(A) Computerisation of library

The following areas of library operations can be computerised.
(a) **Acquisition Work** - It involves various activities such as preparation of book selection slips, acquisition slips, sending orders to vendors, updating the record file, verification of books with order file and invoices, sending reminders etc. While book selection works can be performed by consulting machine readable databases of catalogues, other works can be automated by the application of computers.

(b) **Processing Work** - It mainly involves work such as text input, cataloguing and classification of documents etc. Text input can be done by word processing, optical scanning with the help of computer. Cataloguing or bibliographic descriptions of documents can be obtained from MARC (Machine readable catalogue) OPAC (online-public access catalogue). Similarly, some classification scheme like Dewey Decimal Classification (DDC), 21st edition are available on CD-ROM, with the help of which classification of documents are automated.

(c) **Library Collection** - Owing to computerisation, different types of documents are available on magnetic tapes, discs, drum etc.; optical storage media; holographic storage media etc. instead of microforms or printed materials. Further, these materials are stored in new storage media such as storage cabinets for magnetic storage media; tapes, discs etc.; optical storage; holographic memories etc.

(d) **Browsing and Information retrieval** - With the help of computers, instead of shelf or catalogue browsing, multiple browsing, online browsing of computerised databases are possible. Further, due to this instead of document retrieval, now information or data retrieval is possible.

(e) **Reference work** - The works like SDI, CAS, Bibliographic search etc. which can be computerised by accessing online databases, Internet etc. Translation work can be computerised with the help of computers. Further, various information products such as International documentation lists, online bibliographies etc. can be prepared with the help of computers.
(f) Communication - It can be automated by the introduction of Telex, Teletext, E-mail, Satellite communication, computer networks etc.

Besides, this other functions of libraries like maintenance of accounts, stock verification, serial control, publication activities etc. can also be automated with the help of computers.

(B) Networking of libraries

The new connotation used for library resource sharing is 'Library networking'. Networking among libraries is very common and also essential now-a-days due to the development of information technology, publication of large number of micro and macro documents in each subject fields, scarcity of library fund, users demand for pin-pointed information in quickest time etc. A library Network is defined as a set of interrelated library/information systems associated with communication facilities which adhere to more or less formal agreements and institutional agreements, in order to jointly implement information handling operations with a view to pooling the resources and serving the users better.

The problem of resource sharing among libraries can be solved by different networking systems. It includes WAN, MAN, and LAN through PSTN (Public Switched Telephone Network) by using the computers in two different libraries, PDN (Public Data Network) which works on a packet switched mode and can move from one station to another in hops, SDN (Satellite Data Network) are broadcast networks and message is transmitted by one station and received by other station. SDN may be of single or double hopes.

The networking efforts in India got a boost with the tremendous and fast developments in computer and communication technologies which led to the implementation and successful operation of national and international computer communication networks. In the field of Library & Information
Science the library networking efforts using computer-communication technologies started during the late 1980s with the initiation of metropolitan/city networks like Calcutta Library Network (CALIBNET) and the Delhi Library Network (DELNET), followed by the national level Information and Library Network (INFLIBNET) of UGC. However, prior to the functioning of these networks, certain database producers in the government sectors such as BITS (Biotechnology Information System) of the Department of Biotechnology, and IMC (Indian Medlars Centre), established jointly by NIC & ICMR, started using the NIC's satellite based national level information network called NICNET. At present many library networks exist in India, which can be categorised as follows:

(a) International network – Internet

(b) National networks – (i) ERNET by Dept. of Telecommunication, Govt. of India
   (ii) SIRNET by CSIR, Govt. of India
   (iii) NICNET by NIC, Govt. of India
   (iv) I-NET by Dept. of Telecommunication, Govt. of India
   (v) INFLIBNET by UGC., Govt. of India.

(c) Metropolitan/City networks (i) DELNET (1990) established by NIC & NISSAT
   (ii) CALIBNET (1992) established by NISSAT
   (iii) ADINET (1993) established by INFLIBNET & NISSAT
   (iv) MALIBNET (1993) established by INS/DOC
(v) BONET (1994) established by NCST & NISSAT

(vi) MALIBNET (1994) established by NISSAT

(vii) BALNET (1995) established by NISSAT

More recently some new metropolitan network such as PUNENET, LUKNET have been developed.

(d) Local area network (LAN) – A LAN is a group of computers that share hardware and software resources at the same physical location. The LAN will be based on star, bus or ring topologies or a combination thereof. In India many university, institutional and research libraries have developed LAN facilities.

7.6 IT SKILLS REQUIRED FOR LIBRARY PROFESSIONALS

We are living through a historic period of technological change, which is the result of the development and widening application of information and communication technologies. These technologies, popularly known as Information Technology (IT) are different from and faster than any other technologies, one has seen before. They have a huge potential for opportunity creation, better services and higher standard of living. IT is already an integral part of almost all sectors, such as business, commerce, education, agriculture etc. and also of our daily life.

In the context of libraries, so also the academic libraries and its services, IT has brought a remarkable change. IT in library sense is the acquisition, processing, storage, dissemination and use of vocal, pictorial, textual and numeric information by a microelectronic based combination of computer and telecommunication technology. Advancement in IT has enabled us to change the traditional concept of library where the print and paper media
are the main components to the new concept like 'computerised library', then 'virtual library' and more recently 'digital library'. The basic feature of digital library is that they are network based distributed systems with individual servers responsible for maintaining local collections of digital documents ranging from sets of electronic text to video on demand service. It would provide a coherent, consistent view of many repositories of information allowing users to connect and interact with information irrespective of the geographical location.

Academic libraries are the soul of the academic institutions. It is the essential and critical line between faculty and students. There is no doubt that emergence of IT has changed the traditional library environment to an information environment which is increasingly becoming digital and the IT has a wide ranging impact on library and information work and services. With the advancement of computer technology, storage media have kept on changing over past few decades. The shift has taken place from paper media to non-print microforms and then optical disc storage media. During 1990’s the optical storage media in the form of popular Compact Disc Read Only Memory (CD-ROMs) and more recently in the form of Digital Video Disc (DVD) has become increasingly important as a medium for the storage and dissemination of information with additional advantages of high storage capacity and easy access to information. The exciting growth of different library networking and also the Internet has further changed the functions and services of the library. Due to the development of these networks a library’s status is no longer solely confined to its own collection, rather it has extended to the collections of other libraries irrespective of geographical location. Further the growth of Internet has inspired many libraries to make their collections available online to the public as well as world wide, as a result library and information services, local community information, bibliographic databases, electronic reference works etc. are now a days available through remote login. In recent time Internet is most frequently used for reading and sending electronic mail, transforming files, remote login through various available tools such as WWW, FTP, TELNET etc. The WWW and various web browsers such as Netscape Navigator and
Microsoft Internet Explorer along with new searching tools comprised the next generation Internet resources. Besides, this, IT has tremendous impact on different library house keeping operations, technical communications, library management etc. Thus development of IT is motivating libraries to move from technical services to access services.

All these IT developments, changing functions and dimensions of academic library environment have posed new challenges for library professionals to sustain their professional competencies. In this context there is urgent need of proper human resource planning, so that library professionals will be able to face the new challenges of Information Technology era. The library professionals have to acquire, cultivate knowledge and skills on these technologies such as computer technology, optical discs, databases, multimedia, expert systems, library networking, Internet, digital libraries etc., so that they can access and provide the required information to their users. Otherwise library profession will move towards an unwanted dead profession, and the bread and butter of these professionals will be snatched away by other professionals of IT industries. Some IT skills which are considered as the bare necessities of library professionals are discussed briefly as follows.

7.6.1 Internet

Two or more computers are connected together to form a network to exchange data, share software and hardware resources. Internet is the network of networks. It connects thousands of computers and computer networks worldwide. Subbaram opines Internet as a network of networks spread worldwide. It is a conglomeration of smaller networks and other connected machines spanning the entire globe. Each country has at least one backbone network that operates at a high spread and carries bulk of the traffic. Other networks connect to that backbone. Thus Internet is a worldwide network.

Internet works with the help of transmission protocols across a network. One such protocol is TCP/IP which is developed to allow cooperating
computers to share resources across a network. In recent years TCP/IP is the most successful mechanism for networking of computers worldwide. TCP (Transmission Control Protocol) is responsible for breaking up the message into datagrams, re-assembling them at the other end, re-sending anything that gets lost and putting things back in the right order. IP (Internet Protocol) is responsible for sending individual datagrams. Every IP datagram contains the source address and destination address so that each datagram can be delivered independently. It is TCP module that contains the logic necessary to provide a reliable and virtual circuit. Thus one can contact computers of different platforms in Internet by employing TCP/IP irrespective of the location of computers and the platform such as DOS or UNIX on which it runs.

*What is needed to access Internet*

In order to get hooked to Internet, one needs PC, a phone line, a modem, software and a subscription for Internet connection from an Internet service provider. It means to get connected to Internet, one must have minimum hardware and software configuration. The minimum requirements are:

(a) **Hardware** – A good PC with high-speed 486 machine with 4 to 8 MB RAM, 16 color VGA display and a Modem of 14.4 Kbps with error correction and compression is needed. Along with this, a good laser printer is also needed to print picture after downloading.

(b) **Software** – Besides TCP/IP stacks, programs for terminal connectivity like procomm, browsers like Netscape, Lynx etc. are also needed. Window 95 operating system is considered as an Internet Operating System, since it has inbuilt software for all Internet needs.

(c) **Modem** – A modem (Modulator De-Modulator) with communication software and telephone connection.

(d) **Internet Access Providers** – In Indian Libraries, access to Internet is possible through various agencies like ERNET, VSNL, NICNET etc. ERNET
(Educational and Research Network) has been implemented by DOE (Dept. of Electronics) with initial funding of UNDP and has connection to more than 400 organisations consisting of mainly academic and research organisations. ERNET is also supported by several backbone sites such as DOE, New Delhi; IIT, Madras; IISC, Bangalore; IMTECH, Chandigarh; VECC, Calcutta; IUCCA, Pune; NCST, Bombay; Central University, Hyderabad etc., which enables organisations of different geographical areas to access various services of Internet. VSNL (Videsh Sanchar Nigam Ltd.) offers full range utilities in three options for accessing Gateway Internet Access Service (GIAS). NICNET (National Informatics Centre Network) of NIC, Government of India is one of the important network facilitating

Thus in order to get hooked to Internet, one needs a PC, a phone line, a Modem, software and a subscription for Internet connection from an Internet Service provider. It means to get connected to Internet, one must have minimum hardware and software configuration. The minimum requirements are Hardware, Software, Modem, Internet access provider.

Tools and Utilities

The Internet contains a great wealth of information but it is not so easy to find the desired information on the Net. It requires patience and understanding to develop the skills and techniques to search information on Internet. It means the limitation depends on the users ability to explore the resources of Internet. The various tools and utilities of Internet are discussed below.

(1) Electronic Mail (E-Mail) - Electronic mail is the oldest method of communication on Internet. It combines the advantages of writing with immediacy of the telephone, thus facilitates quick exchange of messages across computers without any wastage of time in dictating, typing, printing, copying and distributing. So by using e-mail, one can send messages or even files to
anyone on Internet. It has advantages over Fax in the sense that it does not matter whether the e-mail of receiver side is log on or log off.

To send messages on e-mail, one needs the e-mail address of the person to whom message is to be send. Internet e-mail addresses are of the form: user @ host.domain. The ‘host.domain’ unambiguously identifies a host. For example: Kumbar@Inflibnet.ernet.in, where ‘kumbar’ is the user name, ‘Inflibnet’ is the host name and ‘ernet.in’ is the domain.

Different e-mail interface program exist for sending and reading mails. Such as ‘mail’, ‘malix’, ‘pine’, ‘ccmail’, ‘eudora’, ‘pepine’ for windows, ‘elm’ for unix computers etc. Besides communication of personal messages, e-mail has been used for operation of electronic news letters and journals, e-mail based information servers, discussion forums etc.

Examples

- Electronic newsletters and journals: PACS-forum (Public Access Computer System Forum), PACS-Review etc.

- E-mail base information servers: Concernet@icich.ncsi.nih.gov., operated by National Cancer Institute, USA, etc.

Discussion forum (Listervs or mail servers):- PACS-L, operated at University of Houston, USA, LIS-FORUM, operated at NCSI, Indian Institute of Science, Bangalore etc.

(II) Remote Login (Telnet) - Telnet is the main Internet protocol, which allows to log on to another system and use various services available on that host. It means Telnet gives opportunity to be on one computer system and log on another computer system irrespective of the distance of both systems. It also offers easy entry into the world of www (World Wide Web), gophers etc. Telnet address may be in domain name format or IP address format.
(III) **Gopher (Tunnelling Through the Net)** - Goapher is a computerised agent which allows you to access what you want without having to know where it is. It means it enables the user to find text files easily and display on their desktop computers without knowing the process of connecting and disconnecting to other computers.

Gopher works in a world of files and menus. Gopher menus are like a directory listing information sources. When a user connects to a gopher server, a set of messages tells the server what the users want to view. It is a tool for browser and it can work in the background while the computer does other work. There is a wide variety of gopher documents along with descriptions which points to the information that might be stored on the hard disk of machine present anywhere.

(IV) **Moving files (Ftp)** - Ftp stands for file transfer through file transfer protocol, which is a tool to transfer file from a remote computer on Internet to one’s computer or vice-versa. The file which is transferred through Ftp includes documents, data, games, computer software etc. Ftp has made it possible to set up publicly accessible archives on Internet with all kinds of documents and software, known as anonymous ftp sites. These materials are held online and can be assessed by anybody having Internet connection. Ftp access is made under user name ‘anonymous’ using the e-mail address as the password.

(V) **World Wide Web (WWW)** - The tools for locating information on Internet like gopher, telnet, Ftp etc. are being merged and becoming accessible through an angle common interface called World Wide Web (WWW). It is client server based distributed hypertext multimedia information system on the Internet. There are three main concepts that characterise the WWW. These are:

(i) **URL (Uniform Resource Locator)** specifies the protocol and locations for information retrieval.
(ii) HTTP (Hyper Text Transfer Protocol) specifies how hypertext documents are transferred through the Internet on the WWW.

(iii) HTML (Hyper Text Markup Language) contains rules for document publishing on the WWW. It contains the text and structure of the document, pictures and links to other Internet sites and locations.

Besides the above mentioned tools, other tools of Internet are BBS (Bulletin Board Systems), Finding someone (Who is), Finger, Archie (Finding Files), Mailing Lists (Listserv), Network News (Usenet) etc.

Commercial Database Vendors on Internet

Now-a-days a large number of commercial online database vendors permit connectivity via Internet, which facilitates information searches at a cheaper rate. By obtaining a USERID and a password from the vendor, one can become a valid user. Some popular database vendors are:

(a) **Dialog (Knight-Ridder Info Service)** – It is largest commercial database vendor. The Databases are mainly full text and includes many major newspapers, patents etc. It can be accessed by the command

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telnet dialog. Com OR http / www. Kr Info Com/
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(b) **STN** – Its is a joint effort of many scientific organisations and this database is available online to the scientists particularly chemists and engineers. It can be accessed by the command “telnet stanc. Ca. Org”

(c) **Bibliographic Research Service (BRS)** – It offers access to databases of medical and scientific collections.

(d) **Data-Star** – It is a online information service which primarily offers access to European trade and business data. It can be accessed by the command “telnet reserve. rs. ch.”

In recent time Internet has proved to be the most powerful information technology for accessing informations on all subjects scattered
worldwide. So librarians can take advantages of this technology to satisfy their users need upto maximum extent in quickest possible time.

7.6.2 Digital libraries

In recent years, Digital Libraries (DLs) are one of the interesting and increasing area of study and research. Generally Digital Libraries contain information in digital form. It provides access to digital information which includes a combination of structured or unstructured data, scanned images, audio and video recordings, graphics etc. It means DLs are libraries which have a number of machine readable publications and facilities for remote access to several databases. Thus the information sources, database and dissemination are completely digitised. The concept of “virtual library” has emerged simultaneously with “Digital Library” perhaps because all the information at present are accessed through networked libraries at the desktop quite virtually without the physical existence of books on shelves. But DLs are one step other than ‘virtual library’ in the sense that the information provided is completely digitized.

There are many definitions, descriptions and varieties of digital libraries but till date no world wide agreement is possible on this. One kind of digital library is that which contains a series of digital audio and video clips or full length movies. Another kind of digital library often discussed is that of content managed and accessed on a web server. Browsers, which enable access to the web contribute to the web servers as a typical wirehouse for digital content.

Need for digital library (DLs)

There are many reasons to use digital library technology than conventional library. One such reason is to manage large amounts of digital content such as a large number of images, audio-clips, video recordings etc. Another reason for digital library is to conserve and preserve the library collections in their original form and to provide more extensive access to their
contents. The advantage of this technology is that it is not possible in traditional libraries due to limitation of library physical facilities and the fragility of the library materials. Another reason to use DLs is to perform searches that are impractical manually with the help of different electronic tool. It allows greater access to content and is capable of managing these contents more effectively, thus providing a way to enrich the learning and teaching environment. Besides the above mentioned reasons, another important reason is that DLs provide ways to identify an owner and protect the content owner’s information.

Features of Digital Library

The important features of Digital Library are:

- manages and provides access to very large collection of information, both primary and secondary.
- these are based on digital technology
- preserves unique collection
- supports multimedia components
- provides links to different digital objects more effectively
- deals with data from multiple location
- enhance the distributed learning and teaching environment
- supports publicity and integration of new information

Components of Digital Library

A good digital library must be properly equipped so as to disseminate the desired information, access out of the digital storage media or digital databases. Accordingly digital library consists of three main components, such as document, technology and operations. Document is the basic component of digital library which contain fixed and permanent records. It also enables to handle fast changing or transient information such as stock market data, manuals etc. DLs are based on digital technology to handle both digital and
non-digital information. With regards to operation, digital libraries are to be used by individuals working alone. It means only one user can use the workstation at a time to perform various operations such as browsing, scanning, searching, reading, writing etc. A digital library requires:

- locally developed database
- computer system with adequate PCs having LAN, CD ROM drives
- E-mail service
- Internet or other network connection to access other databases
- Multimedia kit
- Trained personnel
- Other computer hardware and software accessories like printers, mouse etc.

**Planning and development of digital library**

Digital library and its services must be planned, implemented and supported just like the traditional libraries. It requires integration of several technologies. Before implementation, it is important to develop a strategic plan considering the facts like current and future needs of the users, mission and goals of the institution, physical resources, personnel, organisational structures etc. Physical resources include space, present application system installed etc. Personnel issues include identification of current and future needs of staff as well as changing role of information professionals and performance assessment. In addition to this, cooperation within and across the organisation, budget planning for long term maintenance and replacement system should be taken into consideration throughout the planning process.

**Limitations of digital library**

Although digital library provides access to a large volume of information, it suffers from several limitations. These are:

- compatibility and standardisation of information due to the use of a variety of hardware, software, information collection, storage and retrieval methods;
• copyright and intellectual property right issues;
• browsing on the digitized form is difficult than printed form;
• remote access to documents are uncomfortable than spot access;
• professional skill is required to locate the information on Internet.

The emergence of digital libraries will undoubtedly affect the traditional function of libraries, users, staff, information seekers, publishers etc. DLs are considered as a new technology which can be applied to all kinds of institutions. Advances in technologies such as high resolution capture devices, sophisticated search engines, affordable large storage of digital contents etc. have accelerated the development of digital libraries. In Indian context digital libraries are in budding stage. The revolution of digitalization has started with slow pace and will be accelerated with time. Therefore, the library professionals must be aware about its all components to accept the challenges of changing environment. But unfortunately, currently there are limited opportunities for library professionals to receive training on this new and advance technology. However, through the development of strategic planning, the impediments involved in digital libraries can be removed.

7.6.3 Expert systems

In computer science, one of the most rapidly growing topic is expert system. It has evolved from a long tradition of Artificial Intelligence (AI) research. Thus expert system is considered as a broader discipline of Artificial Intelligence, which is a part of computer science that is concerned with designing intelligent computer system. The expert system offers an opportunity to organise human expertise and experience into a form that computer can manipulate. For example if an expert system is to be built to serve as cataloguer, it must be done by consulting with an expert cataloguer and asking them to codify the rules of cataloguing that guide them in their decision making.
Components of expert system

An expert system is mainly comprised of three component areas. These are the knowledge base, which contains the experts’ knowledge in the problem domain; the inference engine, which is a program that applies the expertise of knowledge base to solve the problems at hand and finally the user interface which enables the user to communicate with the expert system.

(I) The Knowledge Base – It contains codified knowledge or facts of experts of a particular domain and the relation between them. In knowledge base, there are mainly two kinds of facts such as public facts, i.e. the agreed knowledge and heuristics, i.e. personal knowledge and experience of the human experts. For example in a cataloguing knowledge base, cataloguing rules are the public facts and the skill in cataloguing are heuristics.

There are various methods to encode facts and their relationship of a knowledge base such as rule of thumb, seminatic net, object attribute value triplet etc.

(II) The Inference engine – It stands between the knowledge base and the users. It performs two major tasks: First, it examines existing facts and rules and adds new facts when possible; Second, it decides the order in which inferences are made.

(III) User Interface – It is that component of an expert system which enables the user to communicate with the knowledge base. The existing user interfaces are mostly menu driven, which accept a single word or short phrases from the human user. Besides this, a few user interfaces also have natural language capabilities.

Application of expert system in library and information field

Expert systems have been successfully implemented in various sectors like economic and industrial sector, health & medical sector etc. In recent years this technology has been used in different areas of library and
information system. The areas of LIS where expert systems can be developed includes planning and administration, staff management, technical services like classification, cataloguing, indexing, abstracting, reference services, collection development etc.

The development and research activities in LIS expert system is gradually increasing. In India, few expert systems have developed in areas like reference service. In western countries many commercial expert system in LIS domain have been produced. However, the usefulness of expert system depends on increasing power and efficiency of hardware and software. Therefore librarians should be more careful in developing, purchasing and maintaining of expert system to satisfy their clients more effectively.

In the context of emerging technologies, proper human resource planning plays a vital role to sustain the quality and services of the academic libraries. Therefore, steps should be taken to recruit library professionals with computer literacy and IT skills so that they can manage and access the library resources more comfortably. Further the in-service professionals should be given orientation and training in the field of information technology pertaining to library and information science. Further new technologies are emerging day by day. Therefore, it is also necessary to train all library professionals on the latest technology. At the same time the personnel should be motivated to acquire skill and knowledge on the IT and its effective practical use in their libraries. This can be possible by providing them with proper incentives, monetary gains, autonomy, promotion facilities and cooperation. If planning of human resources in academic libraries will be made in the context of present IT era and its future changes, then new development and researches on IT pertaining to library operations, management can be made and storage and dissemination of more information will be possible which is the basic aim of all academic libraries.
References


5. Ibid. p.11-12.


7. Ibid. p.54.


