CHAPTER 6

SPACE PLANNING IN UNIVERSITY LIBRARIES OF MAHARASHTRA

THE GREATEST CHALLENGE facing university libraries all over world, today is lack of space. Everyone is running out of it. The information explosion, budget restrictions, the high cost of space, and expanding collections has placed considerable burdens on university libraries and information centers.

"In 1988, more than 300 billion pounds of paper were generated. Aside from original documents, other types of paper created include photocopies, computer printouts and hard copies of microfilm and microfiche. This translates into an overwhelming amount of information on paper" (129).

The cost of space is still high. Rent varies from a square foot in smaller cities, to larger cities. These prices do not include additional service costs such as cleaning, electricity and air conditioning, which may add another 20 percent to 50 percent to total space costs. The high value of space is one reason for efficient space management; lack of sufficient space is another.

No library has enough space nor does any library want to pay for additional space. Most libraries do not want to pay for information management at all because they do not see it as a billable service or a revenue-generating operation. As a result, libraries do not deal with the need for space until the situation becomes a crisis.

Librarians understand the value of controlling information, but the average major university management does not. The condition of most organizations information systems is dismal. Therefore, librarians and information managers are faced with making the most out of existing space or justifying to management the need for additional space.

Because renovating a library or building a new one is costly, the finished structure must meet the needs of the whole organization. (See Figure 2)

6.1 Financial Considerations:

Although changing a library environment is costly, management must understand that if the library does not change to meet its challenges, it will face even bigger renovation pressure and costs later.

Calculating project costs is essential. One way is to obtain detailed cost information from the contractor or vendor before signing the contract. Changes can be made in the contract if it appears that it might cost more than the allocated funds allow. Less expensive equipment might be substituted for the original order, or as a last resort, the whole library design may have to be re-evaluated and reworked.

The librarian must develop a checklist of everything that needs to be done during the renovation. Before the job is approved, be sure to go through that list and determine that everything was completed satisfactorily.

Do not sign invoices for payment unless the work is done. Equipment is expensive, so make sure everything ordered is needed.

6.1.1 Other Considerations

Financial issues will determine your budget constraints. However, no matter what your budget, you must think about a variety of other factors. A noted European architect, H. Faulkner-Brown, conducted feasibility studies of space and buildings before they became libraries and identified ten criteria to be considered for the new library. (Faulkner-Brown, H. "Feasibility Studies before Adaptation", IFLA Publications 39, "Adaptation of Buildings to Library Use", Michael Dewe, Ed., K.G. Saur, Munich, 1987, P. 17-45). He says that a library should be:

1. **Flexible**: with layout, structure, and services which are easy to adapt;

2. **Compact**: for ease of movement of readers staff and books;

3. **Accessible**: from the exterior into the building and from the entrance to all parts of the building, with an easy, comprehensible plan needing minimum supplementary directions;

4. **Extendible**: to permit future growth with minimum disruption;

5. **Varied**: in its provision of reader spaces, to give wide freedom of choice;
6. Organized: to impose maximum confrontation between books and readers;

7. Comfortable: to promote efficiency of use;

8. Constant in Environment: for the preservation of library materials;

9. Secure: to control user behavior and loss of books; and

10. Economical: to be built and maintained with minimal staff and financial resources.

Designing a library that is attractive, cost effective and user friendly involves numerous planning considerations and factors:

1. **Getting started** – what and how to measure the collection and the equipment in which it is housed.

2. **Evaluating the building** – considering floors, walls, ceilings, windows, columns or pillars, electrical systems, air-handling systems and fire safety and how they relate to the design of the library.

3. **Blue prints and floor plans** – a fast course on what factors to consider when laying out a library, and how to use blueprints and floor plans in the design process.

4. **Equipment and furniture** – what types of shelving and furniture are best for your particular collection needs.

5. **Ergonomics** – the human factor; how work environments can affect productivity and morale.

6. **Technology** – what new technological products are available and how they affect the library design.

7. **Resource sharing** – how to get the most resources with the least amount of space.

6.2 **Getting Started**

BEFORE WE CAN ACCURATELY DETERMINE how much space we will need, we must know how much collection housing we have, as well as how much and what types of material need to be accommodated. These
procedures should be completed simultaneously. Such organization will help ensure that we do not count the same equipment twice.

6.2.1 Measuring the Collection Housing

Why do we need measure the collection housing? It will allow us to determine how much space the equipment actually occupies on the floor – what computer people call “the footprint” – and to calculate how much material the housing we can hold. We will need to pay attention to the latter point for equipment we plan to reuse and not supplement.

We must measure the outer and inner dimensions of each piece of equipment, that is, the height, width and depth of the equipment itself, and the width and depth of the inside of the file drawer or shelf. Measure each of the following:

1. Record the height, width and depth of all shelving and the number of rows per shelving unit. Include any custom shelving built directly into the walls. Write down the manufacturer’s name as well as the weight of the equipment when empty and full. This information will help us determine the floor load capacity.

2. Existing shelving will often be moved to the new location. Mark such equipment when developing floor plans. Use pressure-sensitive removable labels (or the labels will be there permanently). After labeling the shelving, cross-reference the unit to the floor plan.

3. Measure and count equipment in storage unless it will not be repaired or reused.


5. Measure each cabinet or case, regardless of its original use. For example, the microfilm collection may have expanded and overflowed into several boxes, which you should measure and count.

6. Record the number, the type, and the description of file cabinets, such as four-drawer vertical or five-drawer lateral. Do the same for book stacks or bookcases, such as three-and seven-tier units. Do not assume that all equipment is the same size. For instance, some four-drawer vertical cabinets are 25 inches while others are 24 inches. Five-drawer verticals
vary in size, too. Shelves also come in different sizes and there may be custom shelves that were designed to fit certain areas.

7. Check drawers and shelves for disrepair and schedule repair for any equipment that will be reused. If you do not plan on repairing the equipment, make sure any damage will not affect the stored materials.

8. See if the cabinet or shelving unit locks. If so, where is the key? Does it work?

9. Know what the cabinet or shelving unit contains. Some units may not hold what you expect.

6.2.2 Measuring the Collection

Accurate collection measurements provide information for justifying the need for increased space and equipment. These measurements help you determine what will fit where and help you locate the collection on floor plans before and during a move, renovation, or design/reconfiguration.

For greatest accuracy, measure the linear inches (LI) of books actually housed on a particular shelf. Be sure to check circulation records for materials on loan so that they will be included. This method may be time-consuming; if you cannot measure the actual collection, use the shortcuts described later in this chapter. Whatever method you use, be sure to measure sub-collections as well as the main one.

6.2.3 Measuring Sub-collections

Measure sub-collections separately because they often need special or separate housing located apart from the main collection. Examples of sub-collections are un-catalogued material, office collections, non-print items, indexes and abstracts, vertical files, and rare books.

6.2.4. Un-catalogued Material:

Is this material to remain with the main collection? Be sure to indicate the method of arrangement, the material’s condition, and a description of collection contents.

6.2.5 Office Collections:

Some of these items are tools required for a job; others are personal favorites. Indicate the type of material and whether it is catalogued. Get this information from the occupant of the office involved.
6.2.6 Non-print Items (Microforms, CD-ROM, and Magnetic Media):

Accurate description is important here because equipment that houses one form of media may not be suitable for another. Note the contents and the arrangement of the material within the equipment as well as the actual measurement of the collection. Also indicate if special equipment to access the material is required: an example is microform reader / printer.

6.2.7 Indexes and Abstracts:

This material may occupy a single shelf or be spread out over many tables and shelves. Are prior years located in a separate place? If not, you may have to decide how many years of each title can be housed on tables. You can then send the rest into storage or house it on adjacent or back room shelves.

6.2.8 Periodical and Newspaper Display:

Jot down the arrangement and manner of displaying this material.

6.2.9 Audio/Visual Collection:

How full are the storage bins? What are the dimensions of each type of A/V material?

6.2.10 Vertical Files:

Are files kept in regular or special file folders, and are these folders letters or legal size? Flag any full files that need to be broken down into smaller units. This is a good time to determine if new headings are needed or if unused files should be discarded.

6.2.11 Rare Books and Special Collections:

Some special collections are housed away from the main collection; others are located near the reference desk. Check to see if the collection is housed in a section other than its regular call number sequence. In addition, look for under-or-over-sized items, or material (such as maps) in nonstandard shapes.

Keep rare books in a separate location with temperature control, special preservation methods, and security. While conducting a title-by-title inventory, write down any unusual dimensions and special conditions of materials.
6.3 Alternative Collection Measurement Methods:

When an actual shelf inventory and measurement is not possible due to time or financial constraints, consider a shelf list measure. In order to have an accurate count, you should have previously inventoried the material.

6.3.1 Measuring the Shelf List:

This method works best in a large collection with an extensive shelf list. You will need to get the relative size of each call number range and then apply that ratio to the size of the whole collection. First measure the number of cards in the call number range. Estimate that one inch of cards equals 100 volumes, and then calculate the number of volumes in each call number range. Industry standards are six to seven non-reference books per linear foot and five reference books per linear foot. Therefore, by dividing the total number of volumes by five, six or seven (depending on what types of books are in the call number range), you can calculate the linear feet for each call number range.

To avoid frequent shifting of the collection after the move or expansion, estimate the space needed for each call number range now. Be sure to allow for growth and expansion. See the section 6.3.3 on “Projecting Future Growth” below.

6.3.2 On-Line Measures

Most on-line circulation or cataloguing systems give title and volume counts of holdings. But this method is not without problems. For instance, some software does not include a field for material format, so the user cannot tell from the entry if a particular item is, for example, a hardbound volume or in microform.

Serials present a similar problem. Titles are often entered under the name of the series, and the record may or may not include the number of volumes or parts of the single bibliographic record. For example, unless encyclopedias and certain law material are recorded as individual volumes in a circulation system, the only way to accurately measure the number of volumes is to count the entries on the shelf list card.

6.3.3 Projecting Future Growth

Determining the space required future collection growth will enable the new space configuration to work. If you know how fast your collection is growing, use the book-per-linear-foot statistic to calculate how much future space to allocate for a given call number range. To determine how fast your collection is growing, identify the net number of items added to the collection
during the past year and allow for at least that number of items added during the past five years. Then average that number.

Try to tie the anticipated growth to a specific call number sequence and media format. You can allow appropriate shelf space in that area to accommodate growth. Such planning will reduce back shifting as the collection increases. Also, since non-print media are usually housed separately, you will want to know how much space to allow for the growth of these special collections.

Also use organizational or departmental financial information when estimating future growth. Has your collection budget increased or decreased from year-to-year? Do you expect major changes? The answers will give you an idea of the rate of future growth.

Accurately measuring the collection and its housing can be expensive and time-consuming, but completing these steps now can help you avoid surprises later. Doing measurements now will help us determine how items will be configured in the new space.

6.4 Evaluating the Building

Evaluating a building for its use or partial use as a library is becoming increasingly critical for librarians and architects. Less capital is available for building new structures; consequently, space originally designed for other purposes often must be used for a library.

Though type and size differences dictate various space usage requirements, all libraries have common design needs. Refer to H. Faulkner-Brown's ten criteria for libraries, which appear in the beginning of this chapter.

A proper evaluation of the prospective library space will cover both functional/technical and aesthetic considerations. Aesthetics, including lighting, etc. In this part, I will cover functional/technical issues as floor assessment (especially floor load capacity), walls, ceilings, windows, columns and pillars, electrical system, air-handling system, and fire safety considerations.

6.4.1 Floors

To understand floor load, librarians need to be aware of the concepts of dead load and live load. The weight of the building itself is the dead load—that which does not move and always remains the same. This includes elements such as steel, concrete, and wood that makes up the building. The live load, on the other hand, is the weight of items or people that move or can be moved
around the building. In a library, this includes books, equipment, supplies, fixtures, furniture and people.

Believe it or not, too many people in one place at a given time can cause the building to collapse. When calculating load, the weight of these people must be separated from the other components of the live load. That is why, for example, the number of people allowed in a restaurant or auditorium may be limited.

6.4.2 High-Density Mobile Shelving

Floor load capacity is a major concern when high-density mobile shelving is used. Since this equipment can accommodate nearly double the volume of a conventional shelving system in the same area, the floor must be able to hold twice the load.

6.4.3 Walls

In evaluating the building, consider the current and expected future use of walls and wall space. Some walls are movable and should be calculated as part of the live load. Some are solid. Other walls house the building’s heating and wiring systems. Still other walls may not offer hanging space because of such permanent attachments as pipes.

The material the wall is composed of will tell you how to hang supporting shelves, bookcases and other wall-hung items. This, in turn, has weight implications. Many pre-World War II buildings used pressboard for interior walls. Attaching angle braces to pressboard and sheetrock requires special hanging devices that may have a limited load-bearing capacity.

When you need to fasten heavy items to a wall, use the wall studs. A magnet will help you locate the nails that hold the walls to the studs. You also may want to use an electronic device called “The Stud Finder” available in home and building improvement stores. Remember that most studs are either twelve or eighteen inches apart, center to center. Mark stud locations on your floor plans for future reference.

6.4.4 Ceilings

Ceiling height in public or patron areas should be ten feet, while eight-foot-high ceilings work in staff areas. High ceilings mean greater noise level, as well as increased heating and cooling costs. Low ceilings have disadvantages too. Ceilings lower than eight feet limit shelving options. Lighting glare may also become a problem.
Does the space (or will it) have ceiling sprinkler installation? If so, you must, according to fire codes, leave an eighteen-inch clearance between sprinkler-head bottoms and shelving tops. This means that tier stacks that are 881/4 inches high would require a minimum 8-foot, 101/4-inch ceiling to comply with fire code regulations. If 8-foot, 101/4-inch to 9-foot ceilings is unrealistic, sprinklers could be installed parallel in the ceiling between rows of stacks to comply with regulations. If sprinklers are not an issue, still leave adequate clearance to promote air circulation and allow for changing or repairing light fixtures.

6.4.5 Windows

Windows interrupt continuous wall space and affect a building’s lighting and heating requirements. On the human side, windows enhance the environment and provide more comfortable space for patrons, provided the interior design of the building uses the windows advantageously. Because northern exposures provide indirect sunlight, they are ideal for libraries.

6.4.6 Columns and Pillars

Columns and pillars serve a variety of functions: they must be a load-bearing structural support, a decoration, or a conduit for wiring and air handling systems. The location of columns affects layout, space, visibility and security. You can have decorative columns removed, but those used for support or wiring are permanent.

6.4.7 Electrical System

Electrical power also affects space layout and configuration. Gather information on circuits, switch locations, plugs, outlets, electrical closets, and so on.

Wisely allocating power prevents fires, service interruptions, and computer crashes. When manual systems are automated, dedicated lines (electrical lines having no other equipment or outlets sharing the power source) must be used. For computer equipment, invest in a true uninterruptible power system (U.P.S.) that will handle the total voltage of all computer terminals. This affords fewer data errors, protection from lightning and reduced downtime. It also dramatically lowers service expenses and prolongs equipment life.

Avoid rewiring expenses by placing photocopiers, computers, and other electrical equipment next to outlets. As you plan, consult professional electrical engineers and electricians.
6.4.8 Air Handling

Lighting/air-handling relationships need to be consider early in the space planning process. Many lighting fixtures can be installed as part of the heating, ventilating, and air-conditioning system. It is a good idea to make the lighting system a part of the overall heating/ventilating/air-conditioning system, although special circumstances may require otherwise.

6.4.9 Fire Safety

National, state, and local fire safety codes also affect space allocation. The National Fire Protection Association Life Safety Code specifies 200 feet as the maximum travel distance from any point to any exit if the building has no sprinkler system, and 300 feet if the building has one. Dead-end corridors cannot exceed fifty feet; large libraries must have an alarmed one-way exit. Open access to fire doors may be required for libraries in large office buildings. The code specifies that the second exit must be located as far as possible from the first one.

Design characteristics such as floors, ceilings, windows and structural elements (e.g., pillars and columns) all play an important role in determining whether a building can, in fact, be used as a library. Once this decision is made, the creative task of designing the space begins.

6.5 Layout of the Special Library: Blueprints and Floor Plans

SPACE PLANNING IS NOT simply a matter of square feet, equipment and furniture. It is essential to consider psychological factors as well as technical and space issues. In addition, library traffic patterns and work flow must be included in the layout.

The arrangement of book stacks, equipment, workstations, and furniture affects the efficiency of work and the available space. Time and energy may be wasted if staff has to go too far to get the needed materials, or if staff frequently has to leave workstations. Thus, the layout of the equipment and furniture, library collection materials, people, traffic patterns, work flow, lighting, acoustics, and even the colour and décor of the library, greatly affect the way staff and users function in the library.

Irene Place and Estelle Popham, in their book "Information and Records Management" (Englewood Cliffs, NJ: Prentice Hall, 1966, P. 213), state: "Good layout is the conquest of inner space. It considers available office space, arrangement of library equipment, furniture and reference areas, work stations, environment, work flow, and the principles of motion economy".
It is not necessary to be a professional space planner to lay out a library. Library equipment and furniture vendors, architects, consultants, and space design specialists can help to develop the optimum layout. Just get the facts, study them, consult the proper people, and draw the plan. Use a tape measure to measure the exact space available. How long and wide is it? Where are the doors and windows? Where are columns and struts which affect placement of equipment and furniture? Where are the electrical outlets? Make a list of things that will be used in the area. Draw an exact diagram. Show the direction in which the doors swing because doors that swing into a room affect the location of things near room entrances. How many bookshelves and work stations are there?

Libraries are equipment and furniture-intensive. To maximize efficiency and effectiveness, the library should be attractive, usable, and comfortable. If not, it will undermine its main purpose, which is to enable users and staff to function at peak efficiency, locate needed materials quickly, and concentrate on referencing materials with a minimum of interruption and noise.

To renovate an existing library, conduct an inventory of equipment and furniture. This will show current inventory that must be included on the floor plans, which inventory can be discarded, what new equipment and furniture must be purchased and the measurements of new equipment and furniture that can be accommodated in the space.

Five major elements are involved in planning a library. They are:

1. Collection space for book stacks, file equipment, or shelving, microfilm and microfiche storage equipment; and newspaper and journal storage display equipment.

2. Staff space for work stations, technical processing areas, reference desks and circulation desks;

3. User space for reviewing area carrels and chairs, lounges, and microfilm/microfiche reader / printer work stations and chairs;

4. Internal circulation and traffic flow within the library, which translates into easy access to materials, staff, equipment and furniture; and

5. Space for support functions, such as photocopying machines and mail handling.
Collection space is the top priority. Books, periodicals and copy files, and materials in all media formats (e.g., CD-ROM, Microfilm, and Microfiche) are the reasons the special library exists. The collection is the core of the library and must be given sufficient space for current requirements, as well as for future growth and expansion. After that, consider user and staff space requirements.

Furniture and equipment layouts are not easy for the inexperienced space planner. However, it is essential that the space planner consider the building structure, floor load capacity (live and distributed load factors), available usable space, and individual user and staff needs and requirements.

6.5.1 Collection Space

First, determine linear shelving requirements. These measurements are then translated into shelving equipment square footage dimensions which must be drawn exactly to size on the floor plans. To estimate correctly, measure the books and other media to be housed in the library in linear inches or linear feet.
In addition, know the number of library staff members and the number of library users at peak, normal and off times.

The number of books per square foot depends not only on the size of the books, but also on the size of book stacks and bookcases; height of book stacks and bookcases (i.e., the number of tiers / shelves per bookstack or bookcase); depth of shelves; length of ranges (i.e., width of units / sections and number of units / sections per row which make up a range; and widths of aisles between ranges. Remember, doubled-faced ranges (i.e., book ranges that are placed back-to-back) will require aisle space.

Determine the number of books per linear inch or foot, using industry standards or random sampling of shelves. Then, convert linear inches (LI) or linear feet (LF) into the number of shelving units, or into square footage requirements by the following method:

1. Determine the height of the library's ceiling. Building fire code regulations require an eighteen-inch clearance between the tops of shelving and the bottoms of sprinkler heads when there is a ceiling sprinkler system installation. If there are no sprinklers, enough room must be allowed between the tops of shelving and the ceiling to permit the flow of air and, when necessary, the opening of casements.

2. Once the ceiling height, the existence of an overhead sprinkler and any floor loading limitations are known, the planner can determine the height of the shelving. The planner can also determine the number of shelves per shelving section and the number of shelving sections.

3. Measuring the distance between columns and other obstructions in an area will provide the length available for shelving ranges.

4. Determine the number of linear inches or feet of shelving in each section, i.e., the number of shelves per section multiplied by the linear inches or feet per shelf, minus one to two inches per shelf for clearance space.

5. A seven-tier, 36-inch wide unit/section would afford 34 to 35 inches per tier, or a total of 238-245 LI per unit. This is because one should always allow 1 to 2 inches of clearance per shelf to facilitate access and retrieval of books, prevent wear and tear on books and fingers, and preserve the lives of bindings.

6. Knowing the current LI or LF of the library collection and the projected net growth rate, the number of tiers per shelving unit, and the LI or LF
per shelving unit, determine how many units are necessary to house the current book collection and to provide space for growth and expansion.

Remember that when calculating the number of units, double-faced stacks should be counted as two separate units. If standard twelve-inch bookcases or bookshelf depths are used, the square footage is easily computed. The depth and width per unit are multiplied by the number of units. Then, assuming 30 to 36-inch-wide aisles in between shelving ranges or for ranges sharing an aisle, the total square footage required can be calculated by multiplying aisle width by length of shelving range.

If a 10 percent per year collection growth rate is calculated, a library with 3,000 usable square feet for collection housing would require an extra 6,000 square feet in twenty years, or a total of 9,000 square feet. Adding a 6 percent configuration loss would mean that, in twenty years, the collection would need 9,540 square feet. A configuration loss is added because the area probably will have some non-assignable space and will not be perfect square or rectangle.

Aaron Cohen and Elaine Cohen, in their book "Designing and Space Planning for Libraries: a Behavioral Guide" (New York: R.R. Bowkev, 1979, p. 66-67, comments that: "Non-assignable space is space that can't be used for library purposes-corridors, stairwells, elevators, rest rooms, mechanical rooms and such. Non-assignable space also implies non-usable nooks and crannies. It is best to keep it minimum and not more than 25 percent. Too much non-assignable space translates into lack of control and may also necessitate additional staff members besides excessive walking".

For calculation purposes, assume a minimum of 6 percent and average 10 percent configuration loss. However, if the building has substantial non-assignable space or is circular, the configuration loss can be as high as 25 percent.

6.5.2 Standards

Space requirements for staff areas are difficult to generalize. Some studies indicate that fifty to sixty square feet for each clerical employee is adequate.

This provides for a fifty-four-inch desk, chair, file cabinet, and aisle space. However, because of the high space costs in some large cities, actual in-use standards may be as low as forty square feet per clerical worker. Theoretically, space requirements increase as you go up the management ladder. For example, a supervisor would have 100 to 125 square feet; department manager, 200 to 300 square feet; and chief librarian/library director
400 to 450 square feet. Again, actual square footage is often lower in large cities because of high space costs.

Allow space in which personnel can move about and use furniture and equipment. The amount of space needed depends on the shelving and file equipment used, as well as how often staff and users access the material. Staff members' workstations must be placed and translated into exact measurements so that desks, file cabinets, chairs, and book trucks can be drawn correctly on floor plans. Estimate the areas required by staff using the forty to sixty square foot per person standards for clerical workers. Also consider shared equipment such as photocopiers, microfilm or microfiche reader/printers, card catalogues, and book trucks. Be sure to allocate space for office supplies and special functions such as binding. Remember to allow space for bathrooms, lounges, a kitchen, a circulation desk, book trucks and a loading dock.

6.5.3 User Space

Library traffic statistics will tell how many user seats are needed. Pull-out reference shelves allow users to review material at the book stacks and may decrease the number of seats and user reviewing areas and carrels needed. Check any state or organizational standards that might mandate the number of seats per person.

The type and size of chairs have an impact on the amount of space required. Obviously, armchairs take up more space than chairs without arms.

Too much working space can be as serious a problem as not enough space. Be sure to allow enough space, but do not waste it. When planning space requirements for the special library, remember these important points:

1. The layout should be flexible.

2. One large area is preferable to an equivalent area of small rooms because a single area permits better lighting, ventilation, supervision, and communication.

3. Dominant work flows and communication needs should be given the highest priorities.

4. Central service functions like reference work and special equipment should be located conveniently near the departments and personnel whom they service most.
5. Provision should be made for peak load rather than for off-time requirements. Use statistics for past annual volume of work as the basis for planning future requirements.

6. Standard space guidelines should be adhered to in planning and allocating space. Where maximum and minimum standards have been set, maximum standards provide for expansion and usually increase efficiency.

7. Such heavy equipment as photocopiers, file cabinets, and shelving (book stacks) should be positioned only where floor load capacity is sufficient to bear the weight.

8. Adequate floor-based electrical outlets should be provided for computers and typewriters. Wall outlets should also be provided.

9. Bookshelves and file equipment can be used to create corners, aisles, counters, or room dividers. However, this secondary purpose should not disrupt the primary function of housing the collection.

10. Know which way a door swings to prevent placing equipment in its path.

6.5.4 Floor Plans and Blueprints

A floor plan is an architectural scale drawing, showing the size and arrangement of rooms, halls, equipment, and other items on one floor of a building. A blueprint is a photographic reproduction of architectural or engineering plans in black or white on a blue background.

The first step in a space plan or layout is acquiring and studying a recent and accurate floor plan, blueprint, or architectural drawing of the space. Get plans from architects, building engineers, maintenance firms, or building inspectors.

Remember that separate plans are drawn up for plumbing, wiring, furniture, air-handling systems, flooring, carpentry, walls, windows and other structures. Essential plans are those that include accurate markings of permanent physical characteristics, such as walls, columns, pillars, struts, floors and windows. The condition and accuracy of these plans will vary.

Computer-aided design (CAD) software can speed up the space planning process. However, if that is too expensive, use templates, tracing paper, and graph paper either ¼-inch or 1/8-inch scale to produce cutouts which can be moved around on the blue print.
6.5.5 Layout and Design

Heavy traffic areas and areas housing the book collection (bookcases/stacks) should be designed as squares or rectangles because these shapes are the easiest to work with and the most flexible. Because file cabinets and bookcases and stacks are essentially rectangular, they fit better when placed inside a square or rectangular area. Equipment can be run from either north to south or east to west.

In addition to the acoustic and lightening benefits of a square area, there is less walking involved because all points are equidistant from the center. In addition, a square affords centralization and control because all areas within the square can be seen from the center.

If a completely square or rectangular library is not possible, Cohen and Cohen advocate the concept of "the central square". The authors suggest "the central square" for areas with the heaviest user activity because these areas require the most control or supervision. Staff areas, operations and meeting rooms that require privacy and less noise should not be placed in the central square. As the authors say: "The central square area should be the focal point of the library from which all user activities radiate, an open place where people and activities converge"(Cohen and Cohen, 1979, p. 68-69).

Placing stairs and elevators next to each other is an effective use of space. In multilevel libraries, stairs and elevators relate and so should all entrances and exits. In addition, place corridors and walkways that run throughout the library near the departments that use the library most frequently. If there is more than one entrance or exit, each one should be placed closest to the department it serves.

In a multilevel library, the main entrance/exit should be located on the first floor in the most important user area. The first floor also should contain the most important user services.

It is important to determine those services that are used most and how they relate to each other in terms of library space. Services which are expected to grown faster than others should receive more space. Services that might be reduced or eliminated in the future should be considered. This information will help the planner relate areas in the library to each other so that library operates as efficiently as possible. Back office operations such as technical services (cataloguing, book processing), books for interlibrary loan and storage, receiving messengers, and staging the facilitating areas should not be the first function the users see. These services should be in less accessible areas, but still near doors (not the main entrance) to facilitate the flow of materials to and from the library.
6.5.6 Access

Accessibility is important for all libraries. If a library is not accessible or delivery service is not efficient, departments may hoard books or use other sources for information. On the other hand, materials should not be too accessible. Unauthorized personnel should not be permitted to go directly to the book stacks or reference collection. Arrange these areas so that access is controlled.

Shortening aisle widths increases existing collection space. Added space, better collection security, fewer damaged books, and decreased shelf reading time are some advantages to closed stacks. However, disadvantages include decreased browsing capability, linger staff retrieval time, and more complex record keeping procedures.

6.5.7 Agreement

After needed space is estimated for the collection, users, staff, furniture, equipment, and aisles, make a scale layout drawing of every piece of furniture and equipment, with dotted lines showing work flow. By using layout drawings and templates, reconcile what exists with what is needed. Remember to allow adequate space for working areas and aisles.

Lastly, reconcile drawn layouts with the actual usable space and make figures accurate by breaking down each area in the library. Emphasize workflow, and functional arrangements of equipment, workstations, and furniture, including special areas that do not appear under staff, user or collection areas (e.g., special rooms for presentations or meetings). Compare these again with the layouts to make sure the entire interior has been dealt with accurately and nothing has been ignored.

6.6 Furniture and Equipment Selection

SPECIAL NEEDS AND USES should be considered when selecting furniture for the electronic special library. Recommended table and chair heights are different for a computer than those recommended for reading or checking books and periodicals.

Provide furniture for patron as well as staff areas. Patron areas include reading and research rooms and rooms containing specialized equipment such as microform readers/printers, computers, and card or book catalogues (if not on-line).

Evaluate furniture for durability, flexibility, comfort and efficiency, and for its intended use.
6.6.1 Chairs

Chairs are manufactured in materials such as wood, plastic, metal, or a combination of materials. Although not as easy to obtain as they once were, all-wood chairs are the most durable and comfortable. Reading chairs should be used for reading areas, and computer chairs for computer rooms.

6.6.2 Tables

A table must be measured, marked, and placed carefully on a layout, or it will be too short, too long for its new location. The multiple uses of tables allow them to blend in with other furnishings, making them easily missed during the space evaluation process. Tables are used often as microcomputer stations and for microform readers.

Micrographic readers/printers can be placed on carrels or several readers/printers can be arranged on a large table. The latter arrangement is usually preferable because traditional carrels are generally too small to accommodate the reader/printer and also allow enough workspace for the patron. Large carrels can be purchased for readers/printers, but they are more expensive than regular-sized carrels.

Carrels, desks and tables can be used for some computer equipment. However, if the computer includes a driver for CD-ROM or other optical disk applications, the work surface must be at least one foot wider than standard widths to accommodate the equipment.

The height of a desk and chair is important for working comfort. Poorly designed seating greatly contributes to office fatigue. Using seats designed for correct posture not only decreases fatigue, but it also increases efficiency. Adjustable chairs and desks facilitate correct posture and accommodate different sizes of people. Such chairs are necessary for all office work.

6.6.3 Carrels

Carrels can be less space efficient than tables. However, carrels are appropriate in most special library situations where patrons desire privacy. They are generally more functional than tables because they have many uses such as computing, typing, viewing microforms and videotapes, listening to audiotapes and using calculators. Carrels can be wired to accommodate all of these activities. In addition, carrels can have individual lights, telephones, and overhead shelves for books.

A carrel’s work surface should be at least twenty-four inches deep by thirty-six inches wide. However, larger surfaces should be provided for
computer and microform / printer equipment etc. Because special libraries will be using more and more electronic equipment, designers and planners should purchase the oversized carrels.

6.6.4 Desks

Staff will use desks for technical services, circulation and reference. Use standard secretarial desks for staff with clerical duties. For other staff, two-pedestal desks work well. Two-pedestal desks have drawers on both sides of the well, with pull-out writing shelves in each pedestal. The desk surface should be at least sixty inches wide and approximately thirty inches deep. A desk-back unit can provide additional storage space at the rear of the desk. This unit also will give privacy to the desk's occupant.

Wooden desks are usually purchased for reference, circulation, and executive personnel. If wooden desks are used heavily, they should have high-pressure laminate tops or Lucite glass covers. Service desks are usually designed with built-in protection for the surface.

A circulation desk is usually manufactured in modules, with each component serving a separate circulation function. These components can include discharge, charging machine, workstation, typing, open port and corner units, as well as vertical files and book chutes. The units can be purchased individually and configured to meet the special needs of each library. Like desks, the surface of the circulation desk should be protected with a laminate, Lucite, glass, or other wear-resistant material.

6.6.5 Equipment

Library collections can be housed in an almost endless variety of equipment, ranging from standard shelving to push-button, high-density mobile shelving. Equipment should be chosen for its serviceability and suitability for the material to be housed.

In the past, nearly all library materials were books and other paper-based resources, e.g., indexes, abstracts, periodicals and newspapers. Today, the library must keep many different types of material to provide the most up-to-date and comprehensive information to its patrons. New equipment is needed to hold microforms, computer printouts, magnetic and optical media and audio and video equipments, computers, scanners and printers.

However, the special library still needs to provide equipment for traditional library materials such as books, newspapers and periodicals. Also, be sure to provide equipment for a rare book collection or for displaying art
objects or other nonbook material. Electronic resources will continue to grow, but it is doubtful they will ever completely replace paper-based materials.

6.6.6 Shelving

There are many shelving options for libraries; selection of equipment depends on the use of the materials on the shelves. Standard wooden and steel shelving of the bracket type are used most commonly for active materials to which patrons have access. Steel warehouse shelving can be used in closed-access collections. Although a section of warehouse shelving occupies more floor space than a double-faced section of library shelving, it actually has more storage space.

For open-access collections, wooden shelving is generally used in such high visibility areas as reference and circulation. Special-purpose or custom-designed shelving is manufactured more easily in wood than in metal. However, wooden library shelves are the most expensive types of library shelving.

Metal shelves are less expensive and come in three types: Storage or warehouse shelves, slotted or standard shelves and bracket-type shelves. Libraries use bracket shelves more than the other type because they are stable and come in many heights and shelf depths.

Bookstack end panels can be easily cleaned and wear better than metal. Expensive end panels for less costly stacks create a look of richness and coordinate with the library's decor. Steel stacks can be ordered in colors other than grey and sand, or can be refinished using a process called electrostatic painting, which sprays on new colour. Stacks can also be purchased with built-in lighting, or individual lighting can be provided for separate aisles. Lighting every other shelving range is less expensive.

6.6.6.1 Mobile shelving

Use of high-density mobile shelving (compact shelving) should be seriously considered by planners of the new University library. Such shelving can often double the storage of conventional equipment. It also requires fewer permanent aisles, increases security and protects materials from exposure to light, dirt and moisture. It is generally used for closed access stacks.

6.6.7 Cabinets

Several types of file cabinets are effective in libraries. Vertical and lateral file cabinets are used for filing papers and pamphlets and lateral, or flat files, are used for maps and engineering and architectural drawings. Flat files
usually come in five-drawer units, which stack on top of each other. Lateral files are generally easier to use than vertical files and provide greater storage capacity. They require less aisle space than standard vertical file cabinets. Storage cabinets may be needed for audiovisual equipment, telephone books, atlases, microforms and office supplies. As discussed earlier, computer-based resources and micrographic technology require adequate storage space for computers, printers, disks (including floppy and optical disks, especially CD-ROM).

6.6.8 Card Catalogues

While it is recommended that a special library convert its card catalogue to an automated system, some libraries may still be using a hard copy card catalogue system. Most card catalogues cabinets are constructed of wood, which is more durable and less noisy than metal cabinets when drawers are opened. Cabinets are usually sixty-or seventy-two-drawer units and can be purchased in fifteen, seventeen and nineteen-inch lengths. The seventeen-inch size is recommended because it is easy to use and has a large capacity. Placing a reference table nearby is helpful for browsing through the catalogue.

6.6.9 Other Equipment

A fully functioning University library will require other equipment. Do not overlook these items when designing the library; they consume space and electricity and may generate noise. These items include step stools, ladders, book trucks, pamphlet displays, dictionary stands, photocopiers, typewriters, calculators and clocks.

The kind and amount of furniture and equipment in the special library will be influenced by collection requirements, space constraints and user needs. Equally important to the overall effectiveness of the library is ergonomics, the relationship between the furniture and equipment and the people who use it.

6.7 Ergonomics and Space Planning

Ergonomics has come of age because office planners and designers realize that well designed offices will result from considering all factors in the planning stages. Ergonomics is the relationship of humans to their work environment. It involves reconciling the essential factors in an office to produce comfortable and productive work environments. Some concepts associated with ergonomics include:

1. System analysis;
2. Job analysis;
3. Time and work studies;
4. The proper tools and hardware for the worker;
5. Human physiology;
6. Behavioral responses of workers to their work environments; and
7. External factors that effect workers both physically and psychologically, e.g., light, temperature, sound, color, texture, shape, décor and appearance.

Ergonomics also deals with how people interact with machines. Such equipment factors as keyboard arrangement, printer location and type of computer screen affect productivity and worker satisfaction.

6.7.1 Computer Workstations/VDT Screens/Monitors

Most often computer operators complained of glare, poor illumination and poorly designed workstations. For this reason, ergonomics plays a key role in the development of computer workstations and accessories.

Eye strain, musculoskeletal strain and morale problems are associated repeatedly with VDT screens. Prevention involves two basic factors: all components of the workstation must be designed to accommodate the specific tasks and equipment requirements, and all components of the workstation must be engineered to support the physical and psychological needs of the user. The design of the workstation should permit flexibility in size, shape, height, configuration, easy to use and adaptability.

When designing the workstation, make sure that:

1. The worker's eyes are horizontal with the top of the display screen;
2. The viewing angle is 30 to 40 degrees;
3. The distance from the worker's eyes to the screen is thirteen to twenty-four inches;
4. The center of the screen is ten to sixteen inches above the keyboard support surface;
5. The screen tilts or swivels to help adjust for glare and to ease muscle strain in the neck and shoulders;
6. The source documents are as close to the screen as possible to reduce eye movement and eye strain;
7. The viewing distance between the worker and the source document is kept approximately the same as the distance between the worker and the screen to make it easier for the worker's eyes to focus; and
8. The screen is placed parallel to windows and ceiling lights to reduce glare; if not, a glass or plastic filter or screen should be used.
6.7.2 Biomechanics

Biomechanics is the study of the musculoskeletal effort of human beings. Biomechanical factors help in the design of work spaces and layouts that minimize work strain, thus increasing productivity and decreasing errors. The placements of supplies or a telephone at a workstation is extremely important. If these items are not located conveniently and reached easily, the worker is forced to bend and stretch, often placing great strain on the musculoskeletal system.

Hands and wrists that can not lean or rest on the keyboard contribute to muscular strain. Placing wrist rests next to a keyboard provides needed support and reduces muscular stress and fatigue. Swivel tilt bases enable computer terminal adjustment to provide glare-free, comfortable viewing.

6.7.3 Psychological Considerations

Psychological considerations are factors, such as sound, temperature, ventilation, colour and light that can affect workers physically and psychologically.

6.7.4 Noise

Noise attacks the nervous system and creates lethargy, nervous strain and fatigue. It can result in absenteeism, affect a worker’s ability to make decisions and cause physical and medical problems. Proper ergonomic planning can decrease noise levels. Acoustically treated ceilings, floors and walls reduce office noise levels; drapes insulate and protect against excessive light and noise; and carpeting improves the acoustic quality of floors. In addition, typewriters and other office machines should not be placed in front of steel partitions or on desks that will reflect sound.

6.7.5 Temperature, Humidity and Ventilation

Poor ventilation can reduce a worker’s efficiency 10 to 20 percent. When the air is stale and too warm, employees feel drowsy and tired. Good ventilation introduces fresh air, dispels used air, moves air without drafts, maintains 50 percent humidity and cleans the air. Air-conditioning systems and modern filters do this. One study showed that work output for those in air-conditioned offices increased by more than 9 percent over those in offices without air-conditioning.

Offices that are too cold also inhibit work. In one situation, an office was air-conditioned to such a point—30 degrees F, far colder than it would be in winter with heating—which staff had to wear heavy sweaters, gloves and
earmuffs. This affected productivity, energy level and emotional and physical well being. Staff members became sick often during the project, particularly because the outside temperatures of 80-90 degrees F were a drastic contrast.

6.7.6 Lighting

Efficient and effective office illumination has been a major corporate goal for years. Better illumination is directly related to increase in effort and office productivity. Light bounced off shiny surfaces produces glare, which causes eyestrain, headaches and decreased productivity, and is the greatest cause of fatigue in the office today. In addition to causing visual problems, poor lighting can adversely affect employee morale. Finally, lighting consumes more energy than all office components.

Natural light is not always available, so both natural and artificial light are used. Whenever possible, rows of book stacks or file cabinets should be at right angles to windows to allow light to penetrate the aisles and fall across the contents of book shelves and file drawers.

Lighting affects space allocation, especially in open shelving areas where it should be placed between shelving units that face each other in aisles. Lighting is also crucial for computer and other office work.

Fixtures ceiling mounted perpendicular to the stacks. At least one foot of clearance is needed above the stacks. Lighting should be placed four feet-six feet on center. Some light is lost over the tops of the stacks, but the angle of the light, because of the perpendicular configuration, covers all the shelves, stacks can be moved without calculating exactly how the light will fall. This system is good for ceilings nine-feet and lower and is the correct configuration for high-density vertical mobile shelving where the arrangement of stacks varies according to which aisle is opened.

6.8 Library Technology

As INFORMATION TECHNOLOGY advances, is refined and expands its applications, the special library depends increasingly on technologically based resources and services. Resources will always be available in paper, but librarians will more often choose electronic and magnetic-based resources because of their convenience, durability and integrity. The new electronic special library must be planned differently from its predecessors to accommodate state-of-art information services.

Electronic and magnetic based library resources require different kinds and amounts of space than their paper counterparts. Information can be stored more compactly on these media than on paper. Magnetic and optical media are
more durable. Unfortunately, the initial costs for creating the magnetic or optical-based library are high, but ultimately, savings are realized in space, the time spent sorting and replacing damaged materials, and the time used processing papers-based subscriptions to journals, indexes and abstracts, periodicals and other bulk information.

Space considerations for the technologically advanced special library should include the location of the computer hardware, namely, terminals, modems, printers, plotters and many other peripherals; and storage space for the supplies, manuals, directories, backup disks and tapes and telecommunication equipments.

Optical disk technology is an important information technology of special libraries. This technology comes in the form of erasable disks, compact disk-read only memory (CD-ROM), video disks, and non-erasable write once / read many (WORM) disks. Other technologies discussed in this part include satellite transmission systems, on-line services, microform, computer output microfilm (COM), and in-house databases. Other significant technologies are telefacsimile, electronic mail, Internet and local area networks.

6.8.1 Optical Disk Technology

Optical disks store data electronically, and the storage capacity is much greater than magnetic disks. Depending on the size of the optical disk and the compression ratio, one optical may equal 1200 floppy disks. The optical technologies with the greatest impact on special libraries and information centers are erasable and non-erasable optical disks. This includes CD-ROM, WORM, and video disks.

6.8.2 Compact Disk-Read Only Memory (CD-ROM)

CD-ROM distributes large amounts of digital information, either on a stand-alone system or as part of the local area network (LAN). A special license and additional fees are required from the publisher if the CD-ROM is used on a network. The CD-ROM disk can hold more than 540 megabytes of data or the equivalent of 200,000 printed pages (130). Unlike information stored on the floppy disk, CD-ROM data cannot be altered (hence the term, “Write once / read only”). However, information from the CD-ROM can be downloaded from the disk to another program file (e.g., word processing or a spreadsheet) and edited with the appropriate software interface. Any information that can be converted to digital form, such as text, graphics or audio-visual material, can be stored on CD-ROM (131).
6.8.3 Write Once Read Memory (WORM)

A WORM optical storage device (also referred to as Direct Read After Write, or DRAW) permits the storage of information once; it cannot be erased or changed. Because the data cannot be altered, WORM is used mostly for archival storage to protect the integrity of data. WORM can be used to make backup copies of hard disk storage. Blank disks are purchased and information is recorded on the disks from the keyboard, scanner, magnetic media, or other sources.

6.8.4 Space Planning Considerations for Optical Storage

Most of the optical technology applications in special libraries will be microcomputer based. CD-ROM applications run on personal computer that has a CD-ROM drive attached. Other optical storage disks (e.g., WORM and erasable) also run on a personal computer equipped with the appropriate disk drive. Some reprogramming of the DOS program files will be required to accommodate the optical disk drives.

Analog video disks run on video disk players that can be accommodated by a four-foot wide surface. A digital video disk player is used as a peripheral to the personal computer or multi-user system and requires a thirty-inch surface. Adequate electric power should be available (132).

Space should be allocated for the hardware, as well as for disk collections, manuals, computer paper and ribbons. When planning the storage space, growth and expansion should be considered because disk-based resources will accumulate over time.

6.9 Satellite Information Systems

Recent developments in the satellite industry have made it more advantageous for organizations to use satellite-based systems for the transfer of information. Satellites can link branch offices of an organization so that critical information can be delivered quickly. Several recent developments in the industry make it more economical and practical for an organization to establish satellite communication links. Among these developments are transponder space (the satellite transmitter) and the availability of smaller and less expensive hardware. Private systems, VSATs (Very Small Aperture Terminals), or the satellite dish are highly economical systems.

131. Ibid
For large and geographically diverse organizations that use satellite communication, the planners of the special library should consider linking the library or information center to the satellite system. Satellites can be used for document delivery, as well as text, voice or image-based data.

Electronic document delivery via satellite has several advantages:

1. Large amounts of information are distributed at fast speeds; there is a low error rate; it has broadcasting capability;

2. It is independent of distance; and

3. It can handle multi-media documents (e.g., numbers, text, graphics, music, voice, sound, and image).

The configuration of the satellite system includes a personal computer (a telephone and facsimile machine can also be included) linked to a system control center which, in turn, is linked to the outdoor VSAT. The VSAT either sends information to or receives it form the satellite, which has received it from the central site, or hub earth stations.

6.10 On-Line Information Systems

6.10.1 On-Line Data Bases

On-line data base services are a standard resource in most special libraries. These data bases can provide the special librarian with unique information in almost any field. Libraries are turning more frequently to on-line services rather than having expensive subscriptions to journals, abstracts and indexes.

There is an increasing trend among University libraries and research centres all over the world to provide the full text of documents on-line. The full-text data base is another way to expand the special library’s collection without the allocation of additional space.

6.10.2 On-Line Catalogues and Circulation Systems

Any new special library should have an on-line catalogue and circulation system. If an existing special library plans to move or renovate, those plans should include the installation of a computer-based cataloguing, circulation, acquisition and serials control system.

Hard copy catalogues can be converted to an on-line system, and a computer programme can automate manual circulation and technical services
operations. Programmes for these purposes are available commercially as are basic data base packages customized for library applications. Software will require some modification to meet the differing needs of each library. Libraries can use a retrospective conversion facility to change from a hard copy catalogue to an on-line system; they simply start putting acquisitions online.

The online catalogue should network with the organization’s LANs and other information networks to which the special library belongs. Space should be allocated for the computer hardware, as well as for the furniture that houses it.

6.11 Microform Technology

Microform technology is the most traditional method used by libraries to conserve space, preserve materials and increase collection size. It has been used in libraries for more than fifty years. Most information professionals are familiar with the advantages of microform technology, including space savings, speed and convenience of retrieval, security and preservation, fixed file continuity, easy reversion to paper, and the legal admissibility of microfilm records. Disadvantages include the lack of acceptance by patrons, cost, equipment constraints and high conversion turnaround time.

The micrographics industry is attempting to overcome the disadvantages of its product and capitalize on its advantage. Updatable microfilm, coloured microfilm and better equipment are available. Similarly, Computer Output Microfilm (COM) and Computer-Assisted Retrieval (CAR) are two technologies which focus on microfilm's positive aspects.

6.11.1 Computer Output Microfilm (COM)

COM is the production of microfilm from computer processed data. Computerized magnetic tape is transferred to 16mm or 35mm microfilm. The COM system has three major parts: the recording device; the interfacing; sequencing and indexing device; and a printer that can be used to produce hard copy.

COM can store enormous volumes of material in compact form. With COM, facilities computer printouts can be eliminated. Microfilm requires only one to twelve percent of the space of its paper counterpart. For information sharing, microfilm is less cumbersome than paper, especially with quantities of material. Accessing the information is simpler with microfilm, particularly through the use of a computer-assisted retrieval (CAR) unit.

CAR systems have not completely overcome the disadvantages of ordinary microfilm. For example, document clarity is not great, especially
when compared with the excellent images produced by optical storage methods. COM has further disadvantages such as it exorbitant cost, inability to edit stored information, and unproven achievability of the microfilm itself.

6.11.2 Computer-Assisted Retrieval (CAR)

CAR systems have several information management functions. CAR is most often applied to indexing, but is also used for locating and cross-referencing material. CAR is a computer-based index to microfilm images. It can be used on a mainframe, mini, or microcomputer. A basic data base package can create the index, or the librarian can use CAR indexing software, although at much greater cost. A CAR microform system used in the special library would consist of the microfilm storage device, an image retrieval system, computer terminals, a central processing unit and software. The system can have a telecommunications link to remote locations with telephone lines, cables, or satellites.

The primary benefits of CAR systems include fast and efficient retrieval of records, indexing and cross-referencing applications; misfiling reductions; and report generation. CAR systems have the added advantage of over twenty-five years of availability. The limitations of CAR include its high cost, limited access and complex system design.

6.11.3 Space Planning for Microfilm Technology

Because film is air-sensitive, microform storage space should have controlled temperature of approximately 70 degrees F and a relative humidity of 40 to 50 percent. The microform should be protected from water and dust. Film reels require one square foot of storage space for every 100 reels of 35mm film, 200 reels of 16mm, and 2300 fiche. Remember to provide space for the storage of such supplies as paper, bulbs, cleaners and spare parts.

Floor load capacity should be at least 170 pounds per square foot, compared with 150 pounds per square foot for the rest of the library. When planning the space, consider growth and expansion because micrographic-based resources will also accumulate over the years.

Space allocation for the microform work area depends on the system and equipment selected. Select the equipment prior to planning the space so that it can be accommodated comfortably and efficiently in the overall library design. Reserve space next to the reader or reader / printer as a patron work area. The microform work area should be sound proofed to absorb machine and residual noise.
6.12 In-House Data Base

A library may want to develop an in-house data base of specialized information which may not be commercially available. Data base software can produce an in-house data base, or if the information is voluminous and will be distributed widely, it may be appropriate to produce CD-ROM or can be web based on Internet.

If the information for the data base is not in digital form and only exists on paper or microform, you must convert the information to digital format. The documents can be entered into the computer by a data entry operator. Although accurate, this is costly and time consuming. An alternative is to use a scanner and convert the printed page to machine-readable form and can link the full text to the bibliographical data. This can be also connected to the Internet under the name of University platform.

There are currently two types of scanning: Optical character recognition (OCR) and Image Scanning. OCR software is used to scan standard type fonts, i.e., typewritten text. Image scanners will scan typeset text and graphics. The latter scanning method is used for graphics reproduction and desktop publishing applications.

The electronic special library makes unique demands on the architecture and interior design of the special library. Computer equipment requires a secure environment and adequate wiring for electric power and telecommunications services as well as air-conditioning the whole area.

Most of the electronic information service offered by the special library will be microcomputer-based, namely, CD-ROM, online data bases, online catalogues and optical disks. Each of these will require peripheral or telecommunications links. Planning for these technologies should include a degree of flexibility because technologies are upgraded frequently and older models may quickly become obsolete. Micrographics technology is less sensitive to sweeping technological innovations, but its roles as a traditional library storage device and collection enhancer could diminish as optical technology becomes more accessible and affordable.

6.13 Increasing Resource Sharing

PARTICIPATION IN LIBRARY and information networks and consortia enables libraries to expand their collections without allocating additional space. The desirability of the network approach is enhanced now by electronic technology.
The electronic library is a fact of life. Special library service is dependent on the technological support provided by computers, telecommunications systems, micrographic equipment and audio-visual devices. This technology is the basis of improved networks and resource sharing programs now available to special libraries.

Networking has several advantages; increased and timelier access to a greater base of information for organization employees or other library patrons, and significant savings in acquisitions, administrative overhead, and work hours spent maintaining, sorting, disposing of, and storing the collection. There are two kinds of networks; internal networks that are part of an organization’s operations and external networks in which member libraries participate. All special libraries with sizable collections in their fields benefit from participation in regional and national data bases.

6.13.1 Establishing the Network

Sharing collections saves space and increase resources. Collections are shared through either existing interlibrary loan (ILL) programmes in University Libraries in Maharashtra or through the creation of new interlibrary loan projects. Loan programmes permit the availability of increased resources, particularly journals, periodicals and newspaper articles, which are especially suitable for ILL programs. Collection development can be planned to complement, rather than duplicate, the resources of member libraries.

Cooperation is imperative in establishing networks among the university libraries of Maharashtra, and there should be a strong commitment to planning and managing the network. Agree on subject areas and priorities. Establish standards, particularly with computer hardware and software, in order to achieve compatibility for data transfer. There should be some flexibility for upgrading the technology and the resources as the technology is always changing.

6.13.2 Interlibrary Loan (ILL)

The growing sophistication of information technology has expanded the options that libraries and information centers have for sharing resources. Interlibrary loan traditionally has not played a vital role in the dissemination of information because a typical ILL transaction is slow. A three-to-five-day delivery time (via surface mail) is inappropriate in a financial or medical library or any other organization where vital information is required immediately. The potential of the ILL program is now being realized because of dramatic improvements to existing products and the development of new products for information transfer. The software used by British Library and Library of Congress will be more useful in this regard.
6.13.3 Technology for Resource Sharing

Several new technologies have been developed and tested for use in library resource-sharing programs. Some of these technologies have greater potential for the immediate future than others. The technologies discussed in this part are telefacsimile, electronic mail and local area networks.

6.13.3.1 Telefacsimile (FAX)

FAX is the process of transmitting printed and graphic documents over telephone lines. Although libraries have been using FAX machines for more than forty years, there was little satisfaction with its performance. Transmission was slow (about four and one-half to six minutes per page), the process was labor intensive and document clarity was poor. Facsimile has come to the forefront of the new technologies largely because it involves little capital investment and installed and maintained easily. FAX costs less than courier and overnight mail services and gets the information or document to its destination more quickly.

Currently, digital FAX equipment can transmit a page in fifteen to sixty seconds, while significantly improving document clarity. An automatic document feeder facilitates the transmission of multi-page documents. Page feeders are a standard FAX option, although the number of pages they hold varies.

A FAX network with other frequently contacted University libraries or organizations (or a special library with satellite collections) is more advantageous than an independent installation because it allows for standardization of equipment and transmission procedures, as well as for reduced costs. Costs are lower on dedicated FAX networks because billing is for the actual time used. On voice transmission lines, billing is done in one-minute increments. Dedicated FAX networks are particularly advantageous to special libraries with heavy FAX volumes, such as law and medical libraries. (See Appendix E)

Stand-Alone versus PC-FAX

A FAX machine can be either a stand-alone unit or a personal computer equipped with a FAX board (PC_FAX). Although both types will transmit printed and graphic documents similarly, there are differences.

The stand-alone FAX hardware includes a scanner, modem and telephone. Some Faxes are multipurpose; they are configured as a photocopier, telephone answering machine, and printer for dedicated word processors and
personal computers. For the latter, the FAX must be equipped with communications software.

A personal computer can double as a FAX machine when a FAX board is installed. Only computer-generated data can be sent via the PC-FAX, an advantage to the special librarian who can send the results of an on-line database query directly to the requestor’s computer file. Hard copy documents cannot be transmitted with a PC-FAX unless the document is first scanned into the FAX format. The personal computer should be equipped with a high-quality printer (e.g., a laser or inkjet) if a hard copy of FAX document is required. FAX documents are not read by the printer as text documents, but rather as picture files. The decoding of the picture file by the printer can take a considerable amount of time. PC-FAX messages can be downloaded to the word processing package with intelligent character recognition (ICR) software.

Accessibility to the FAX is more limited with a PC-FAX configuration than with the stand-alone machine. Generally, a stand-alone FAX is used by many people; personal computers usually are used by one person, thus limiting access to the FAX function.

Some PC-FAX packages allow the computer’s use for word processing, database, and other applications, even when the PC-FAX mode is operating. With PC-FAX, the computer receives the document and a screen prompt or mailbox message alerts the addressee. If the PC-FAX is unable to accept Faxes, “in the back-ground”, use of the personal computer for other work is severely restricted.

**Space Planning Considerations**

The stand-alone FAX is small and easy to install. Place it in an area of the library where it is accessible to patrons and staff, but will not interfere with research or other work requiring a noise-free environment. Electric power and telephone lines should be nearby.

### 6.13.3.2 Electronic Mail (E-Mail)

Electronic mail is the delivery of messages from one terminal to another through a host computer. It is becoming an integral part of communications systems. In libraries, E-mail is used for interlibrary loan, document delivery, and general communications as well as the library’s on-line catalogue.

There are two types of E-mail: locally-oriented systems within the physical confines of the organization that houses the computer, and geographically diverse systems which are served by commercial and public E-mail systems. A closed but commercial E-mail system is also available for
organizations that need to communicate with branch offices or other remote installations.

A public system provides access to on-line data bases world-wide, and vital research information can be obtained quickly. A requested document can be delivered electronically, or a hard copy can be obtained via surface mail or courier service.

Assisting with research services is just one of E-mail’s functions in the special library. E-mail and the on-line catalog can be linked to transmit bibliographic records, using the machine-readable cataloging (MARC) format. E-mail can alert users to recent acquisitions to the collection, a selective dissemination of information (SDI) function. Yet another function is the use of a template for creating and transmitting bibliographic records in ILL transactions. E-mail allows users to make specific requests, to suggest new acquisitions, or to check the status of a reserved item. E-mail service can be used to eliminate many of the clerical and paper-intensive tasks required by the library’s technical services operations.

Incompatibility is a problem with today’s E-mail. Unlike the telefacsimile industry, efforts towards E-mail standardization are not progressing quickly. Most E-mail compatibility problems are related to the address, text and tracking codes, which are different within each service. A uniform code for each address would be created by an international standard, thus allowing global exchange of information.

6.13.3.3 Local Area Network (LAN)

The special library or information center can increase accessibility to its resources with a local area network (LAN). Text, graphics, and audio and video can be distributed through the LAN. A LAN can provide access to the on-line catalog, data bases, engineering and architectural drawings, and any other resources stored on CD-ROM or other optical storage media. Peripherals can also be linked and shared by the networks.

**Transmission Media**

The LAN does not use external telephone lines or any other commercial telecommunication systems for its communications. The most common cabling for LANs are twisted pair, shielded wire, and fiber optics.

Twisted pair is most economical for applications that do not require high speed and/or great distance. Shielded coaxial cable provides higher transmission speeds over longer distances than does twisted pair. However, it is unwieldy and expensive to install. Fiber optic cable is constructed from
glass, and light pulses transmit the signals. The advantages of fiber optic cable are very high transmission speeds, no electro-magnetic interference, high security and easy installation. The disadvantages are cost because of the need for expensive interfaces.

**LAN Configurations**

There are four major types of network configurations; star, bus, tree and ring. The star configuration connects terminals (either dumb or intelligent) to a centralized computer. The central network file server feeds the data to the central computer. The bus configuration connects all computers directly to the main cable line. Signals are sent along the line, and the targeted addresses will accept messages from the sender. Data meant for one address will bypass the non-targeted addresses.

Computers are hooked to file servers that disseminate the data. The ring configuration is the fourth type of LAN. It is a circle of cable to which the terminals are linked. Signals are passed around the ring and accepted by a computer when the signal is recognized. Otherwise, the signal bypasses the terminal and moves to the next one.

**Space Planning for the LAN**

The installation of LANs is becoming more common place, and many organizations are including the library or information center on the network. When installing LAN, pay attention to the building and its interior design. Wiring is an important consideration because the LAN will require extensive cabling that could be affected by the building’s architecture. For example, older buildings might have soil walls, meaning the cable should be run on the outside of the wall.

Other considerations concerning cable installation include existing cable and its location, local fire regulations for wire shielding, and tape of cable for the LAN being installed. LAN terminals should have convenient electrical outlets, and there should be appropriate space for the terminals.

**6.13.3.4 Traditional Library Networks and Consortia**

State and regional networks generally serve the interests of public libraries, although some “Public” networks accommodate special subject interest. For example, the major network for health sciences libraries in the United States is the Regional Medical Library Network coordinated by the National Library of Medicine. This network provides the on-line service called Medical Literature Analysis and Retrieval System (MEDLARS).
Because of competition within their industry, special libraries might consider their resources and information proprietary and might be inclined not to join or establish consortia. However, for an industry which requires diverse and extensive research information, participation in consortia could eliminate the need for libraries to house similar types of information.

Many special libraries in the New York City area are members of the New York Metropolitan Reference and Research Library Agency (METRO). Members include the Engineering Societies Libraries, Metropolitan Museum Library, and New York Zoological Society Library. According to its charter, METRO makes “the best use of already available resources through cooperative efforts and in the same manner, builds additional resources when appropriate”. METRO focuses on advanced information resources and services which public libraries cannot always provide.

Special libraries participate in other library consortia across the country. Some industries provide information networks, albeit informal, to industry organizations. For example, the textile industry sponsors the Textile Information Users Council, which is a loosely structured textile information network.

6.13.3.5 Bibliographic Utilities and Service Centers

Bibliographic network systems offer technical services support to special libraries through such providers as the On-Line Computer Library Center (OCLC), Research Libraries Information Network (RLIN), and University of Toronto Library Automation Services (Utlas). All the bibliographic data is derived from MARC tapes developed by the Library of Congress.

6.13.3.5.1 On-Line Computer Library Center (OCLC)

OCLC offers special libraries shared cataloguing, serials control, on-line union catalogue, on-line reference, interlibrary loan, and retrospective conversion of manual records into machine readable form. User groups have been formed within particular industries for the benefit of OCLC participants and are sometimes affiliated with a professional association.

6.13.3.5.2 Research Libraries Information Network (RLIN)

RLIN is a bibliographic utility operated by the Research Libraries group, a corporation with thirty-three member libraries. RLIN is targeted at research and academic libraries and uses MARC tapes as the basis of its services. RLIN is more subject-oriented than OCLC, thus offering an advantage to special libraries. It provides specialized data bases for the art and geography fields.
6.13.3.5.3 University of Toronto Library Automation System (UTLAS)

UTLAS is another bibliographic utility offering cataloging, acquisition, interlibrary loan, computer output microfilm (COM) catalogues, acquisition lists, magnetic tapes and catalogue cards.

Smaller, regional-based networks, also called service centers, exist across the country and provide retrospective conversion services, microfilm catalogs, on-line searching, hardware, electronic mail services, serials control and data base management. Some of these service centers include the Capital Consortium Network (CAPCOM) in Washington, D.C.; Federal Library and Information Network (FEDLINK), also in Washington; New England Library and Information Network (NETLINET), based in Newton, Massachusetts; and Minnesota Interlibrary Telecommunication Exchange (MINTEX), from Minneapolis.

Whether designing a new library or upgrading or expanding an existing one, you should plan to participate in networks. The networks will enable the special library to expand its collection without requiring additional space. Traditional library networks and consortia are useful. However, electronically based networks using state-of-the-art technologies should be a priority. FAX networks and LAN offer the most data transfer potential for the immediate future. Emerging technologies such as satellite systems and video text and disks, will also make contributions to resource sharing in libraries. When designing the new special library, provide adequate space using these technologies.

In India, Information Technology is going to play a very important role in the various types of libraries of the future and, therefore, must be an integral part of the future plans of the libraries.

The use of computers in libraries has been of great help in the acquisition, serial control, cataloguing, circulation besides keeping tracks of stocks and users. Through the use of computers and other communication facilities, sharing of resources is becoming more and more important and thus the inter-dependence on the other libraries to meet the ever increasing demands. Library Networks have been established for co-operation and resource sharing among libraries. In India, the process of modernization of libraries and establishment of library networks arrived on the scene quite late. Efforts were made by NISSAT to help establish CALIBNET in 1986. DELNET in 1988 and others like ADINET, PUNENET, BONET subsequently. The UGC established INFLIBNET in 1988. INSDOC supported the formation of MALIBNET in 1983. Besides these networks, several library networks came into reality and now provide a centralized database of library information, to be accessed by its user libraries for the purpose of resource sharing.
Information Technology simplifies the coming together of the disciplines of electronic, computer hardware and software, communication (in particular telecommunication), artificial intelligence and human machine interface. Information Technology acts as one of the most important influence in education, culture and society. Information Technology, through the melding of computer technology with communication, digital imaging and full-motion video and sound, can be a powerful ally to improve education and thus improve skills for gainful employment. Libraries and Librarians will have to change to save money, manpower and space in the University Libraries of Maharashtra in the changing Information Technology scenario.