Space management in TIFR library: a case study
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Discusses the importance of space management in support of the functions of special libraries and reviews current solutions on library space management by pinpointing their advantages and disadvantages. Introduces CR (Compact Racks) as a tool for library space management because of its capacity for analyzing spatial data and interactive information. Outlines a proposal that attempts to highlight the process of developing, implementing, maintaining, and utilizing a CR system for special libraries with reference to Scientific Information Resources Centre (SIRC), Tata Institute of Fundamental Research (TIFR).

Introduction

Librarians are concerned with publications including their selection, bibliographic organization, efficient retrieval, etc. Despite the primacy of these intellectual functions, library operation requires attention to many routine tasks, one of which is the housing or shelving of the materials acquired. The lack of space in libraries has resulted in various solutions or combination of solutions which includes weeding and discarding, decentralization, transfer of part of the collection, storage and the compact shelving of the collection. Weeding is difficult and expensive as material withdrawn from the collection succumbs to negative reaction from library clientele and hence this has little appeal amongst most librarians. Less used but valuable books must not be discarded in a cavalier manner and material of very less value should neither be retained. Discarding outlived material at the rate of acquiring new ones is another solution but few situations exist which permit this alternative to be practiced. Like weeding, discarding is expensive, particularly in terms of staff time i.e., in selecting and in changing bibliographic records. Decentralization of the collection is a more acceptable approach, the transfer of part of the collection to branch or departmental libraries has proved effective in diminishing shelving costs and saving space, while the situation may initially be relieved, eventually the collection may face the same spatial problems.

Gaining information about space and facilities is crucial to the operations of organizations. Libraries, especially special libraries that are generally constructed on a large scale are also no exception. Designing a powerful space management tool can help libraries increase the efficiency and effectiveness of their daily operations. The goal of libraries is to “develop an efficient and harmonious balance of all the elements that make up a library”.

The space problem of large collections as well as those of libraries that have almost reached their capacity is obvious. What has been belatedly recognized are the significant secondary problems and costs that are involved. Collections containing a significant number of necessary but little-used books are an impediment to the patrons’ accessibility to titles. Such collections increase the costs of public service and maintenance, necessitate extensive shifting with subsequent damage to the books, and in general diminish the quality and quantity of patron satisfaction.

The concept of storage has been utilized in a combination of ways. Regional or cooperative book storage warehouses are one approach; another is for the library to acquire (build or lease) storage space in the vicinity. Book storage warehousing is widespread, as indicated by Plumb. It not only provides savings in construction (low cost structures on cheap land) but also results in the reduction of expenses for lighting, heat, ventilation installations, floor coverings, decoration, maintenance, and
shelving. Almost all of these economies are possible since access is severely limited or denied to the library patron. Compact book shelving techniques need not be confined to the storage warehouse situation. Indeed, just as it is done in Europe, a compact book storage area may be created within the library itself.

To be counted among the disadvantages of storage warehousing are the elimination of browsing as well as a calculated loss of book use. Equally true is the fact that the patron must be inconvenienced while the item is being retrieved. However, this vital issue is succinctly delineated by both Simon and Metcalf who remind us that space demands require decisions either to keep all books at the first level of accessibility, committing larger portions of our budgets to new construction and upkeep, or to control and contain those demands allowing for the reassignment of funds to cover other library functions.

It should be noted that spatial problems are not limited to large research libraries alone. All too often the construction of a new building begins only when the current one has reached or exceeded its capacity, thereby creating, at least temporarily and in part, the transfer, storage, and retrieval problems of the large research library. Conversely it may be decided that a new building cannot be built and the lack of funds or land precludes expansion, thereby requiring the maximum use of existing space. It should be noted that even the library administrator with a building having a growth potential of many years could by the judicious use of the techniques and solutions, increase the quality of public service, optimize expenditures for overhead, maintenance, shifting, and cataloging, and in other ways increase the effectiveness of his operation.

Library space management

Libraries are object-intensive facilities. Their resources, services, and programs depend on the installation of certain types of furniture and equipment. Planning for developing new library’s space should be achieved under supervision of planning and designing committee with members including librarian, architect, designer, chairman and members of library committee. It is important to consider items as centrality in selecting library location; flexibility to expanding space, security and convenience in designing; and also, efficiency and simplicity of interior design. In the early stages of architectural planning for any library, stipulations for future development are commonly anticipated by designers. Their expectations, however, generally fail to keep up with dynamic changes in the real world. Accordingly, libraries have to schedule sporadic space re-arrangements in order to accommodate these changes and the decisions about these re-arrangements rest primarily on information derived from daily operations. There are many situations in daily library operations that inspire consideration of space reorganization. Researchers have systematically explored the causes of space innovations. For example, Fraley and Anderson pinpointed four key conditions under which library space restructuring needs to be programmed. These include:

- Lack of collection growth space;
- Lack of space for people;
- Change in direction or mission of the organization or community served by libraries; and
- Introduction of new services

Similar studies concentrated lately on balancing of print materials and digital and online information owing to the increase of information technology in modern libraries. Collection growth has been a common topic in library research. The infinite increase of collection numbers is unfortunately restricted by the space ability of libraries. A variety of strategies has been adopted by libraries to control the size of stocks, such as collection pruning, weeding and grafting. Space management has become an everyday activity of many libraries. Space reorganization can be caused by internal changes involving services for library users or restructuring library staff. Changes in libraries are not similar. Libraries which have not been changed or expanded over a period of time cannot remain efficient for long and it becomes necessary for them to be changed in conformity with current situation. Some change or replacement would happen when instruments and equipments are introduced as a part of modernization. It is essential for libraries to manage the information on space usage for both collection and non-collection sectors. In general, changes in library may include: changes in content, structure, goals, instruments and equipments, developmental changes, technical services changes and changes in programming. The changes made by space management tools mostly focus on structure that is called expanding changes. For example, when the collection of library reaches to 100000 volumes, organization of the library should be expanded, some sections should be enlarged and some should be expanded to two or three sections.
Librarians expect to allocate more space for computers and digital equipment in the future, in contrast to the reduction of library space for print collections. The irony is that, while digitization is believed to drive print out of libraries, hard copy publications are still proliferating. Everyone thinks there will come a day when hard copy collection will come to an abrupt stop, but more than likely that event will occur far into the future. An increasing number of books and periodicals are being published in third world and developing countries, especially in the Far East.

Historically, the techniques of compact book storage have dominated the literature. However, it has been only in the last two decades that any appreciable effort and interest have been directed toward determining the costs of investments necessary to achieve the long-term economies envisioned. Initially, cost considerations were limited to the storage area factors, alternatives to additional buildings, and comparisons of equipment. Gradually research began to focus upon the more discrete aspects of compact storage, these included the selection of materials, the correcting or creating of records, the physical transfer of materials, and their retrieval, all of which, when placed in their proper perspective, were recognized as integral and significant aspects of the investment. A number of studies focused upon storage criteria, optimum lot size for transfer, variables determining the efficiency of storage stack capacity, location and indexes of the quality of library services vis-à-vis book accessibility. Another changing situation that could potentially trigger library space reorganization is the visible adjustment in the educational mission of many libraries. An obvious example is that the libraries have concentrated more on providing users with learning and teaching environment. Instructional activities for bibliographic control or online database searches have constituted an important part of library routines now. The development of information technology makes such efforts possible and easy. The most important technologies affecting libraries, library sciences, and its sources are information and communication technologies. These technologies have had some effects on designing library spaces such as changes in physical nature of media in library, as it is evident in adding up electronic books and audiovisual sources which in turn, have led to adding instruments necessary for using these new media, such as various types of computers, as well as, changing physical structure of the library, for example, establishing computer section, information centers and so on.

In addition to the situations discussed above, many other elements may also require a reconfiguration of library space, e.g. the introduction of new services and the change of team structures of library staff. The principle is clear that space changes are unavoidable after the construction of a library and during its normal operations. Not only is the concept of space management fundamental for the implementation of space reorganization, but it is also important for maintaining the effectiveness and efficiency of everyday library functions.

A space management system becomes paramount for the maintenance of a flexible and functional library. An ideal system is one that allows automation and can be managed easily with great precision.

**Tata Institute of Fundamental Research**

The Tata Institute of Fundamental Research was established in 1945. It is an autonomous institute under the umbrella of the Department of Atomic Energy of the Government of India. The basic research is carried on core subject areas of mathematics, physics, astronomy, biology, chemical sciences, and computer science which functions under three major schools: the School of Mathematics, the School of Natural Sciences, and the School of Technology and Computer Science.

Immediately after its founding in 1945, the institute began with a small library to cater to the research needs of scientists. With the gradual expansion of the research activities, the library also grew. With changes in information technology, the library had to grow beyond its function as a depository of information. The library was renamed as Scientific Information Resource Centre (SIRC) in 2007 which provides multimedia information to scientists. Although the service is primarily meant for scientists in TIFR, the SIRC also extends limited facilities to scientists of other government and government-aided organizations.

SIRC presently has a collection of more than 70,000 books mainly covering the subjects such as astronomy and astrophysics, chemical physics, theoretical computer science, condensed matter physics, high energy physics, material science, mathematics, molecular biology, nuclear and atomic physics, and theoretical physics. It has received national acclaim for its quality. SIRC subscribes to around 650 foreign journals covering the above-mentioned subject.
areas. It also has a large collection (1,000,000 approx.) of bound volumes of journals, some dating back to 1820s.

In addition to books, journals and electronic resources, SIRC has a collection of non-book materials such as theses, maps and audio-visual materials. SIRC has also maintained a special collection of the manuscripts of Prof. Harish Chandra and Prof. C.P. Ramanujan, and original drawings of Dr. Homi Bhabha. The collection is housed mainly in three stack rooms: Journals Stack, Books Stack and Extension Area. The Extension Area stocks bound volumes of discontinued journals, some less used books and very old bound volumes of currently subscribed journals.

Space management system: practices in libraries

In practice, majority of libraries lack an automated space management system in their daily operations. In most cases, if space reorganization is planned, librarians launch investigations to get feedback via interviews and questionnaires from library users, or seek to discover user behavior via personal observation, in order to analyze the utilization of physical space and facilities. This data, which may be summarized through statistical analysis, serves as the basis for librarians to make decisions about space reconsideration. Alongside the development of information technologies and the recognition of computer power by libraries, some standardized planning tools have recently been introduced to the management of library facilities. In 1961, the preliminary edition of a study conducted at the University of Chicago, entitled *Patterns in the Use of Books in Large Research Libraries*, by Fussler and Simon, assumed that research collections can be divided into a more frequently and a less frequently used portion, and that substantial savings could be achieved by housing the less frequently used portion in a more compact manner than with conventional stack shelving. The cost of housing large stack book collection reduces substantially, if some reasonable fraction of the total collection is placed in compact storage. Compact storage of books can save significant operating and capital sums, possibly ranging from 60 to 77 per cent of the costs of the conventional housing. New buildings for libraries and storage areas must meet the construction requirements necessary for compact storage so as to fulfill the fifth law of library science “Library is a growing organism”.

Compact shelves as a space management tool

Compact shelves are designed so that rows can be moved next to each other, with no intervening aisle, to provide dense storage. By moving rows together, it is possible to eliminate aisles. An aisle can be created between any two rows as needed. Generally rows are parallel to each other, although they may be on a central pivot. Depending on the system, compact shelving may be moved using a manual crank or an electric motor.

Demerits of compact shelving

- Compact shelving is high density storage and such shelving systems put enormous strain on the floor. Due to weight increase associated with the use of such type of shelving, it is advised to install the racks only in basements or on ground floors of buildings, where adequate structural support can be guaranteed.

- Installation of compact shelving requires advance planning as the rail upon which the carriages ride need to be embedded in the concrete slab.

- Compact shelving could only be used for storing items which only need to be accessed occasionally due to the fact that shelves which are not being accessed will be collapsed together, thereby restricting easy access to items.

Perpendicular sliding compact racks

The perpendicular sliding compact racks (PSCR) were derived from parallel sliding bookcases, but the principal pioneering value of (PSCR) lies in the fact that they showed how the frontal passages could be utilized during operations without a decrease in the higher compactness achieved in basic (closed) position, they therefore contribute to a permanent increased capacity of storage areas.

In (PSCR) installation, the cases are placed tightly next to each other, so that the compact unit is uninterrupted by frontal passages. The bookcases slide perpendicularly in to the space which is taken up in basic closed position by the neighboring bookcase; a temporary passage is produced by the movement of neighboring bookcases into the reserved passage at the end of the whole row of bookcases which formed the composite compact unit. By a reverse movement, the whole system is brought back into the basic closed position. Thus it is sufficient
to have just one open area with minimum standard width, instead of abnormally wide passage.

**Decision making and implementation process**

As with many libraries, SIRC also has been facing severe space problems. A number of alternatives were thought upon before deciding upon the type of shelving and the space required to setup the system i.e., constructing a new building which was scraped due to budget constraints from the institute, off-campus storage has been already practiced by shifting some of the bound volumes of the journals to TIFR field stations i.e., Homi Bhabha Centre for Science Education, and Cosmic Ray Laboratory. One of the alternatives was to construct book storage facility within the campus so that library materials can be stored compactly in a way that increases the number of volumes per assignable square foot of floor space. The library committee members and librarian decided to adopt compact shelving for the bound volumes as basement area was already allotted to library for the construction of a storage facility unit. Visits were undertaken by the library committee members and the chairman to learn about various storage units. In process visits to Asiatic society library, Mumbai and National Institute of Reproductive Research library, Parel was made to study the functioning of compact shelves.

Numerous factors such as selection, processing, transportation and circulation costs from a storage facility were taken into consideration. Cost refers to buying of the compact racks and its installation, which is a one-time investment. Decision was also to be taken whether to go for electric or manual one. Once the materials to be shifted were identified, additional processing was required to effect the move, which necessitates changing the online catalogue entry records to reflect the material’s current location. Transportation includes shifting of materials selected to be moved physically on book carts to storage facility, for this additional staff needs to be hired to do the shifting work and a professional staff be kept in charge to supervise the overall movement of the materials, once the setup of compact shelves were installed in the basement. After the installation and set of the compact racks, the circulation process might be time consuming as once the demand for the material is made a library professional has to visit basement along with room keys where compact racks are installed and locate the position of the journal and using manual crank open the shelves where possible material is placed and bring those to the main library where those materials are again processed before issuing it to the user.

**Specifications**

Perpendicular sliding compact racks implemented in SIRC are specified as follows:

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**Compact racks**

- No. of racks: 16
- Height: 11 ft.
- Length: 10.5 ft. (3 blocks) and 12 ft. (4 blocks)
- Width: 22 inches
- Gap between two shelves: 14 inches
- Total no of shelves in 16 racks: 930
- Total cost: Rs. 13,78,000 lakh

**Normal fix racks**

- No. of racks: 27
- Height: 8 ft.
- Length: 9 ft.
- Width: 22 inches
- Gap between two shelves: 12 inches
- Total no of shelves in 27 racks: 1134
- Total cost: Rs. 16,20,000 lacs

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**Figure 1 — Schematic diagram of the compact racks**

Area occupied is 2500 sq ft. for compact racks.
Normal fix racks

Each rack contains 42 shelves

27 racks = 27 x 42 = 1134 shelves

Area occupied is 5000 sq ft. for normal racks.

Total area saved = Area occupied by normal racks - Area occupied by compact racks

Total area saved = 5000 - 2500

= 2500 sq ft.

Thus we can deduce that area saved with the implementation of compact racks is 2500 sq ft. which is 50% less than with comparison to area occupied by the normal racks. TIFR is located in Mumbai where real estate is very expensive and constructing a new library building is not feasible on the budget. The need for more space for bound volumes storage was solved by implementing compact racks in TIFR basement area.

Table 1 presents comparative data on crucial question of the economics of compact storage in relation to space as well as cost. The question is posed in terms of no. of shelves required to shelve the fixed no. of bound volumes, the area occupied by the equipments used for shelving purpose i.e. Normal racks versus Compact racks and cost involved in buying the racks. On comparison it is found that normal racks occupy 5000 sq ft of area and each rack contains 42 shelves, total no. of racks accommodating 30,000 bound volumes is 27. The cost of each rack is 33,000/- hence the total is summed to be 16,2000. Whereas the compact racks occupy 2500 sq ft. area which is 50% less than the area occupied by the normal racks. Each compact rack consists of 64 no. of shelves in 14 big racks and 16 no. of shelves in 2 small racks, therefore the total no. of racks used are 16, hence the same collection of 30,000 bound volumes was accommodated in 928 shelves in compact racks. The total cost incurred on compact shelves was 13,78000.

On cost comparison, it was found that compact shelving provides more cost advantage against normal racks, which is about 15% less than the conventional storage method. On an average SIRC adds 2000 bound volumes (approx) annually to the library collection. The compact racks capacity is 30,000 so as to shelve more bound volumes in near future. Hence we can deduct that space problem for next 15 years for bound volumes is solved by implementation of compact storage system.

Conclusion

Space as a commodity in the library has been subjected to increasingly refined analysis. Of all the areas in the library, the book stacks have undergone the most careful scrutiny, resulting in various solutions or combinations of solutions, one of them includes compact shelving. In libraries where space is ample and many empty shelves are waiting to be filled, librarians tend to pay little attention to shelving methods, but when library shelves become overcrowded, the librarian is temporarily diverted from educational and intellectual concerns and forced to focus attention on the economics of book storage. For librarians, interest in book storage systems should not be taken as a sign of predilection for gadgetry or mechanics but as a task requirement of which they can make the best possible use of the resources placed at their disposal. Compact racks are used as a tool of storage management in SIRC, TIFR, so as to obtain maximum utilization of storage area which was running short on storage spaces, the implementation of compact shelves ensured maximum protection for the collection, lower custodial service, repair, maintenance, security, ground maintenance and lower cost in book delivery and reshelving. However, since all types of compact shelving installation do involve some reduction in direct and easy access to books, overall savings in terms of space as well as cost has to be substantial before librarians resort to such measures.
References