

CHAPTER TEN

MODERN LIBRARY BUILDING DESIGN: THE EFFECTS ON NATURAL VENTILATION AND HEALTH OF THE USERS

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ABSTRACT

Recently, the astronomic increase in student enrollment and university population has necessitated extensions to existing campus library structures. As a result, hasty extensions often fail to adopt sustainable design strategies such as natural ventilation, thus rendering the projects unsustainable due to the need for mechanical ventilation systems. The unity in planning a library determines the usability of the library. A library building that works is a product of its designers or clients that understand and apply the behavioural element of the planning process. In summary, it is desirable to form a small building committee to handle the full process of library building. This committee may consist of representatives from all the concerned groups, as well as the architect and the librarian. One of the recommendations made in the study was that a building committee should be appointed to assist in the preparation of a concept programme evaluation of building plans.

KEYWORDS: Library, Building design, Natural ventilation and Users health

INTRODUCTION

Historically, patrons have come to academic libraries not only for the intellectual resources they offer, but for the spaces in which to seriously engage those resources. Many studies on space utilization in the library have been carried out, examining areas such as planning of a new library, renovation or rebuilding processes, remodeling of old library buildings or major renovations to create additional spaces or improve the environment for effective quality services in support of learning and research. Outside the classroom, undergraduate students have a decided preference to using the library for their academic work (Applegate, 2009), while ethnographic and observational studies by Bryant, Matthews & Walton, 2009; Suarez, 2007, cited by Cunningham and Tabur, 2012), confirm that even though students are not using the print collection, they

are, however, engaged in academic work when in the library. Though the emergence of technology seems to be threatening the physical use of the library, visits are still being paid to the libraries. Cannell (2007), on his own part, noted that the library is used as a place to find books and electronic resources, get help with work, use e-learning resources, celebrate research, and meet together. The library is a convenient place for students to revise for examinations, do course and research works. Students are able to use books and electronic information simultaneously. Ugwuanyi, et. al (2011) reported the library as a place of learning that encourages browsing ability, use of special collections, offers help by the library staff, a convenient space and materials to do academic work, where to experience digital libraries, celebrate research and new discoveries, and meet other researchers and students for cross-disciplinary discussion and creativity to flourish. Renovation and modern spaces are considered in supporting student learning. One of the more recent studies, done by Bailin (2011) at the University of New South Wales, attempted to assess how well the recently renovated library met the needs of students. Bailin found that near equal proportions of students were coming to the library for the quiet study space, lounge space and to use the computers.

CONCEPT OF LIBRARY

A library is a collection of materials, books or media that are easily accessible for use and not just for display purposes. A library varies widely in size and is organized for use and maintained by a public body such as a government, an institution or school, a corporation, or a private individual. It is responsible for housing updated information in order to meet the user's needs on a daily basis (Wikipedia 2021). A Library provides physical (hard copies documents) or digital access (soft copies) materials, and may be a physical location or a virtual space, or both. A library's collection can include printed materials and other physical resources in many formats, such as DVDs, CDs, and cassettes, as well as access to information, music, or other content held in bibliographic databases. In *The Librarian's Book of Lists* (Chicago: ALA, 2010), George Eberhart offers this definition: "A library is a collection of resources in a variety of formats that is organized by information professionals or other experts who provide convenient physical, digital, bibliographic, or intellectual access and offer targeted services and programs with the mission of educating, informing, or entertaining a variety of audiences and the goal of stimulating individual learning and advancing society as a whole. An academic library has become a centre for information access and distribution, learning and teaching activities, presentations and exhibitions, and social network connections. The main purpose of a library is to disseminate books and information for free or close to free, to archive information, to provide a community space for people to interact around information. Therefore, give people the tools necessary to manage information in a sensible way. Access to the documents in the libraries is made possible and easier for users through the various catalogues in the libraries, which serve as indexes to the library's holdings (Akande 2013). Libraries emerged in ancient times as an institution to preserve recorded knowledge. Then, knowledge was recorded on clay tablets called cuneiform by a form of writing known as pictographs. The earliest civilization started in Mesopotamia, and there was also the first organized library open to scholars. The Medieval period witnessed the emergence of monastic libraries, where learning and scholarly work existed. During this period, some leading universities also sprang up in Europe. Some of these universities, according to Edoka (2000), were

established in Bologna and Salerno in Italy, Paris in France, and Oxford in England. Gradually, libraries formed prominent parts of these universities where the classics and contemporary writings of the Western world were preserved. The renaissance, which led to the invention of printing and the broadening of literacy through the distribution of knowledge and ideas, signaled the emergence of different types of libraries. These libraries were established to help the parent institution to achieve their goals of study, teaching, learning and research. To achieve this, the university library provides a variety of informational materials and services for students and staff (both academic and non-academic) to support academic programmes and research. It also provides a serene environment for learning and research. The academic library is the heart of any university, both as a pivot of learning and research. Freeman (2005) emphasised that the academic library as a place holds a unique position on campus as it symbolically and physically represents the academic heart of an institution. He maintained that its architectural expression and seating continue to reflect the unique legacy and traditions of the institutions of which it is a part. The library is important because it affects cultures, it affects innovation and it affects individuals. Because of all this, library architecture has the responsibility to enhance these effects by providing a knowledge center that is inspirational and conducive to good communication and teaching interactions.

CONCEPT OF LIBRARY BUILDING

Library building is a quiet and conducive area provided for studying, as well as common areas for group study and collaboration, and may provide public facilities for access to their electronic resources for instance Computers and Desktop and access to the Internet. It is a place in where literary, musical, artistic, or reference materials (such as books, manuscripts, recordings, or films) are kept for use but not for sale. Library building must be designed and built in such a way as to accommodate any change in library structure and services. The introduction of modern information technology into the library profession has caused reorganization of library services and structure. To satisfy this current development in the library information systems and reader services, new library buildings now follow the principles of flexibility (Wikipedia 2021). The library's clientele and therefore the services offered vary depending on its type: users of a public library have different needs from those of a special library, for example. Libraries may also be community hubs, where programs are delivered and people engage in lifelong learning. Modern libraries extend their services beyond the physical walls of a building by providing material accessible by electronic means, including from home via the Internet. Hence managing information in an information world has become very easy simply because information can be provided or being accessed virtually by people who are in remote areas and other places away from the Library. Aesthetic is an important factor in the library building. New library buildings should pay attention to the expression of beauty as representing knowledge and culture. This idea is shown in the combination of such aspect as exterior look, interior layout, artistic design and natural environment. This makes the library environment attractive and inviting to users. A good library building must provide many functions in relations to recent developments in formats of documents, the ways of reading, the methods of document delivery and the diverse library activities. It must provide variety of informational materials such as books in print form, audiovisual materials, electronic products and internet services. It must provide enough spaces to accommodate these

materials and at the same time provide a good study, teaching, learning and research environment for various categories of library users will be accommodated and has to provide a good study, teaching, learning and research environment for various categories of library users.

CONCEPT OF MODERN LIBRARY

A modern library is a social organization which uses technology to offer information services. The services are offered to its heterogeneous population on a 24X7 basis as and when required. It does not limit itself to offering "place-based services". Thomas (2009) strongly believes that modern libraries are relevant in this present age. He stated that librarians, architects, and users are collaborating to produce elegant and functional allocations and new purposes that incorporate flexibility and comfort to create an environment that is welcoming and supports a range of research and learning activities. Modern libraries have a social function in making knowledge publicly available. They play two pivotal roles, firstly, to serve as a local centre of information and knowledge and secondly, to be a local gateway to national and global knowledge. They also serve as gateways to the world of knowledge for children by offering a wide spectrum of books to ignite their minds. The library is important because it affects cultures, it affects innovation and it affects individuals. Because of all this, library architecture has the responsibility to enhance these effects by providing a knowledge center that is inspirational and conducive to good communication and teaching interactions. A modern library is expected to operate under these principles as identified by Yunliang (2001): openness, multifunctionality, flexibility, and artistry. The principles of information commonality are also built upon these basic features. Cannell S. (2007) enumerated five guiding principles for a successful information common. These are open, free, comfortable, inspiring and practical. A library should provide free, convenient and rapid standards to apply this principle of flexibility. The library building must be designed and built in such a way as to accommodate any change in library structure and services. The introduction of modern information technology into the library profession has caused reorganization of library services and structure. To satisfy this current development in the library information systems and reader services, new library buildings now follow the principles of flexibility. It uses unified module size, unified floor height and unified building load. In the 3U standard, the unified module size of the library building considers the size and arrangement of the regular reading desk and the book shelves in the reading area. It supports the need for flexible separation of library areas and saves space at the same time (Yunliang, 2001).

MODERN LIBRARY BUILDING DESIGN

Modern library architecture and design is an evolving craft as technology changes the dynamics of space, yet we will always crave the act of choosing a classic novel from a bookshelf-lined wall with a ladder for top-shelf access. The design of the library should be based on the existing campus context. Architects need to explore a design method that inherits the historical features but makes the library harmonize with the campus environment. On the other hand, with the development of society, ecological planning has become more and more important in modern architectural design. Therefore, the ecological design method contributes much to a successful library design (Elsevier 2015). The façade design enables the balance between and the combination of classic with modern style and also human-oriented functional design

enables the functional layout of the library and its easy access to readers. The library is designed with well-organized spaces and management to satisfy everyone. One factor that led to the publication of the IFLA Library Building Guidelines (KG Saur, 2007) was the "fact that designing and constructing a new library is an art that most library directors and professional librarians only experience once or only very occasionally in their professional lives". However, those same library professionals can gain much from colleagues and others who have been there before them and it is a crucial stage in the planning process to build on the existing body of knowledge and experience.

CONCEPT OF NATURAL VENTILATIONS

The principles of natural ventilation in buildings are relatively simple and straight-forward, relying on wind, thermal buoyancy or both as driving forces (Kleiven, 2003). There are, however, a whole range of subtle and sophisticated ways to take advantage of the natural driving forces to promote the ventilation principles. This is exemplified in a number of both new and old buildings that utilize natural driving forces for ventilation. The utilization of natural ventilation in modern buildings is, as earlier stated, almost without exception, done in conjunction with a mechanical driving force that assists the natural forces in periods when they do not suffice. The combination of natural and mechanical driving forces is most commonly referred to as hybrid or mixed mode ventilation in the literature. We have, however, decided to use the term natural ventilation in our work, even if auxiliary fans are installed in the buildings we deal with. The reason for this is that our focus is on the "natural part" of the ventilation system and the consequences this part has in our respective fields of profession. The prospective of natural ventilation ought to be considerable, as the focus and effort of the last half century have been almost solely on optimizing mechanical rather than natural ventilation. The goal of modern natural ventilation is to utilize the natural driving forces as effectively as possible, for as much of the time as possible, to minimize the use of energy for fans and mechanical cooling.

CONCEPT OF HUMAN HEALTH

Health is a state of complete physical, mental and social well-being. This is a level of functional and (or) metabolic efficiency of a person in mind, body, and spirit; being free from illness, injury or pain (as in "good health" or "healthy"). According to (Wikipedia 2020), human health is the ability of individuals or communities to adapt and self-manage when facing physical, mental, or social challenges. Brinkel, Khan, and Kraemer (2009) noted that human health is defined not only by the physical state of individuals, but rather as a state of complete physical, psychological, and social wellbeing. The most widely accepted definition of good health is that of the World Health Organization Constitution. It states: "health is a state of complete physical, mental and social well-being and is not merely the absence of disease or infirmity" (World Health Organization, 1946). Huber et al. (2011) proposed a new definition of health as 'the ability to adapt and to self-manage', which includes the ability of people to adapt to their situation as key to health. It also acknowledges the subjective element of health; what health and wellbeing mean will differ from one person to the next, depending on the context and their needs. An understanding of health is the basis of all health care. Health is not perceived the same way by all the members of a community, including various professional groups (like biomedical scientists, social scientists, health administrators, and ecologists), giving rise to confusion about the concept of

health. Health has evolved over the centuries from the concept of individual concern to a worldwide social goal. The various changing concepts of health are as follows: biomedical, ecological, psychological, and holistic concepts. The biomedical concept, traditionally, is a health system that has been considered as the absence of diseases, and if someone was free from disease, then that person was considered healthy. This concept is known as a biomedical concept, and it is based on the "germ theory of disease."

MODERN LIBRARY BUILDING AND VENTILATION

The Modern Ventilated Library Building refers to a library building that relies on natural wind flow for its ventilation. The cognitive perception of the users of buildings is influenced by the indoor environmental performance of the library building. Modern library building ventilation is a sustainable design strategy that can potentially address the issues typically associated with mechanical ventilation. The functionality of buildings can ensure natural air flow and cross ventilation, eliminating the need for expensive mechanical ventilation devices. The first recorded example of natural ventilation in library buildings is the Kenneth Dike library of Nigeria's premier institution, the University of Ibadan (UI). Although constructed in 1948, the structure of the UI library was acclaimed as the magnum opus of tropical library architecture at the time. This was largely due to its fusion of aesthetics, form, and functionality. The functionality of buildings can ensure natural air flow and cross ventilation, eliminating the need for expensive mechanical ventilation devices. The long form and narrow shape of the structure are widely ventilated and oriented so as to facilitate natural wind flows for effective cross ventilation.

MODERN LIBRARY BUILDING AND USERS HEALTH

Modern libraries, as the custodians of information and resources, really need to be matched with the user's health. Basic infrastructure for connectivity and interoperability must be put in place, including human resources, to support more digital projects (Norasiah, 2011). The implementation of digital formats for library resources is the current trend that libraries must take into consideration, as users might want to access them easily and remotely. If modern libraries are unable to follow societal changes and developments by meeting their users' needs, the psychological health of the users may be at risk. The establishment of effective communication with the user base is crucial to let the users know that the library provides products and services which are relevant to their needs with little or zero health hazard. According to Lohite, Bodade and Dudhe (2016), room occupants also add heat to the room, since the normal body temperature is much higher than the room temperature. It is important to note that the comfort temperatures to the tune of 31.5 °C with or without the use of fan were achieved in indoor environments in Hyderabad study, as against the stipulated standard comfort zone of (23-26 °C). In that case the designers and the builders of the libraries must be health conscious of the users and so they must make adequate space with good ventilation for the users in the library.

According to Salim (2013), the library as a nation-building agent could create a heart, mind, and positive attitude towards community. Also, Lang (2012) posited that if environmental elements do not have the capability to meet the behavioral patterns of individuals, environmental adequacy is minimized and people take sides, abandoning

the environment. The emotional evaluation of the physical environment-architecture leads us to avoidant-tendency behavior and these emotional states have a direct impact on our mental performance (McAndrew, 2012). The modern library environment is a space that includes the omnipresence of man, which takes all aspects of the individual and social life of humans with various activities like reading, lecturing, etc. These activities affect the room humidity.

Maroof and Jones (2009) from their Malaysian Mosque study point found that humidity had an overarching influence on thermal comfort than temperature, and that 30°C was tolerable, with even a minor increase in the humidity adversely affecting the comfort than temperature. Literature indicates that, relative humidity as low as 9 % is judged comfortable over long periods of time. However, an acceptable range extends from 30 % to 65 %, with the optimum at about 50 %. High relative humidity, together with high air temperature, increases heat stress because the body cannot be cooled by evaporation. Steadman (1979) found out that Maximum relative humidity is 62.62 % in May and the lowest is 51.88% in February. It is generally observed that maximum temperatures are in the month of January.

Therefore, regarding studies of environmental psychologists, it can be stated that the library's environment design without noticing the users' needs and psychological issues of users, in addition to depriving them of security and comfort, will lead to users' escape from the environment. Thus, the physical environment must support the expected needs of library users, and the physical space nature of libraries should be designed in such a way that current patterns of behavior can be achieved in these places.

SUMMARY

Modern libraries have a social function in making knowledge publicly available and play two pivotal roles: first, serving as a local centre of information and knowledge; and second, being a local gateway to national and global knowledge. Also, a library is a collection of resource materials in a variety of formats that are organized by information professionals or other experts who provide convenient physical, digital, bibliographic, or intellectual access and offer targeted services and programs with the mission of educating, informing, or entertaining a variety of audiences, with the goal of stimulating individual learning and advancing society as a whole.

RECOMMENDATIONS

1. The provided materials in the library should be well organized and made accessible to potential users.
2. Library building and space management should be actively taught in library schools, in order to prepare future library administrators.
3. In order to satisfy this current development in the library's information systems and reader services, new library buildings should now follow the principles of flexibility.
4. The design of a modern library should be based on the existing campus context. That is, architects need to explore a design method that inherits the historical features to make the library harmonize with the campus.

REFERENCES

- Akande, S. O. (2013). Pattern of First Year Students Use of the University Library: A survey at the University of Ibadan. *Lagos Journal of Library & Information Science*, 2(1):22-26.
- ALA (2010). *Definition of a Library: General Definition*. Chicago: ALA. Available at: <https://libguides.ala.org/library-definition>
- Andrew, M. C. & Francis, T. (2012). *Environment Psychology*. Translated by Mahmoodi, Gholamreza; Tehran, Vania, ZarbafAsl.
- Applegate, R. (2009). The library is for studying: Student preferences for study space. *Journal of Academic Librarianship*, 35(4):341-346.
- Bailin, K. (2011). Changes in Academic Library Space: A Case Study at the University of New South Wales. *Australian Academic & Research Libraries* 42(4):342-359.
- Brinkel, J., Khan, M. H. & Kraemer, A. K. (2009). A Systematic Review of Arsenic Exposure and Its Social and *Mental Health Effects with Special Reference to Bangladesh*. *Int. J Environ Res Public Health*, 6(5): 1609-1619.
- Bryant, J. Matthews, G. and Walton, G. (2009). Academic libraries and social and learning space: A case study of Loughborough University Library, UK. *Journal of Librarianship & Information Science*, 41(1):7-18.
- Cannell, S. (2007). The changing research environment: Implications for library space. *SCONUL Focus*, 40: 43-46.
- Edoka, B. E (2000). Introduction to Library Science. *J. Acad. Lib.* 20: 517-532.
- Elsevier (2015) *Urban Planning and Architecture Design for Sustainable Development*. Available at: <https://pdf.sciencedirectassets.com/277811/1-s2>.
- Freeman, G. T. (2005). *The library as place: Changes in learning patterns, collections, Technology and use in the library as place: Rethinking Roles, Rethinking space*. Washington. Council inf. Resour., pp. 1-9.
- Huber, J. A., Knottnerus, L., Green, H., & Van Der Horst (2011). How should we define health? *Bjm*, 343: d4163
- Lang, J. (2012). *Creating architectural theory: The role of behavioural sciences in environmental design*. Translated by Eynifar Alirza, Tehran, University of Tehran press.
- Norasiah Haji Harun (2011). Digital libraries in Malaysia: Problems faced and factors for future growth. *Journal of Information and Knowledge Management*, 1(4), 87-99.
- Suarez, D. (2007). What students do when they study in the library: Using ethnographic methods to observe student behavior, *Electronic Journal of Academic and Special Librarianship* 8(3).

- Syed Salim Agha Syed Azmatullah (2013). *The changing role of Malaysian libraries in the digital age*. Cabaran pem bangunan perpustakaan: esei esei memperingati Shaharbanun Jaafardan Shahaneem Hanoum Dadameah. Kuala Lumpur: Persatuan Pustakawan Malaysia.
- Tommy, K. (2003). *Natural Ventilation in Buildings*. Available at: <http://seedengr.com/Natural%20Ventilation%20in%20Buildings.pdf>
- Ugwuanyi, C. F., Okwor, R. N. & Ezeji, E. C. (2011). Library space and place: nature, use and impact on academic library. *International Journal of Library and Information Science*, 3(5): 92-97.
- Wikipedia (2020). *Health and fitness*. Wikipedia, the free encyclopedia. Available at https://en.wikipedia.org/wiki/Wikipedia:Contents/Health_and_fitness
- Wikipedia (2021). *Library*. Wikipedia, the free encyclopedia. Available at <https://en.wikipedia.org/wiki/Library>
- Yunliang, M. A. (2001). *The Development of Library Building in Shanghai*. In Library Buildings in a changing Environment. Bisbrouck M ed. Proceedings of the Eleventh seminar of the IFLA Section on Library buildings and Equipment, Shanghai, China. PP. 14-18.