

FLEXIBILITY CONCEPT IN OPTIMIZATION OF TECHNOLOGY AND CREATIVITY FOR DOMESTIC TRANSFORMATION

***Monika Shekhar Gupta **Prof. L.K. Jain**

*Associate Professor, Amity School of Architecture and Planning,
Amity University Madhya Pradesh, Gwalior (M.P.)

** Director, Amity School of Architecture and Planning,
Amity University Madhya Pradesh, Gwalior (M.P.)

Abstract

The success of architecture is directly connected to its flexibility. People use their homes and workplaces in their own individual way. "Altering your environment to your own requirements is a common characteristic of transforming a building from an anonymous space into a specific place". The German philosopher Martin Heidegger

The flexibility is an important concept in the design of housing, particularly for the economical weaker sections and lower income groups of populations, as most of the of people that live in multistory apartments find difficult to accommodate their families because of the fixed space available in the apartments in mega cities of India. The problem lies in the severe shortage of land at affordable prices to the group for building individual houses and forced to choose the available shelter options not designed suiting to their requirements. During the day time, most of the living space is required for the daily activities but at night this space can be designed for sleeping. Similarly, the furniture which is not used 24 hours, if folded, a lot of space can be created. The research findings reveal that there are gaps in terms of lack of flexibility and multifunctional living spaces, design and construction of modular units for multistory apartments suiting to the requirements of the people and the flexibility concept has not been attempted for such segments of population in India. Human beings are flexible individuals who are mobile, creative, and capable of operating in a wide range of environments as in the past one who can change himself as per the conditions will only survive.

This paper uniquely analyzes how the flexible architecture comes out to be a solution for prevailing problems in different countries and explores the characteristics of flexible architecture to open building principles and examines the effect that such design can have within the different levels in the built environment.

Keywords: Adaptive reuse, Low Cost, Sustainable, Flexibility, Innovation, Multifunctional.

1. INTRODUCTION

Flexibility in architecture was introduced by Walter Gropius in 1950s which has progressed to a more advance level in few decades. A lot of research has been conducted in this field, which largely describes contemporary flexible architecture as designed for multipurpose utilization. Global consumerism, availability of materials and new technology adopted play a vital role in its world wide acceptance. The advanced techniques adopted in the design of buildings, structures, products, gave the opportunity to the interior space elements like ceiling, furniture, windows, doors, etc., not to be rigid, thus allowing for more flexibility space wise, setting wise, beauty wise etc. The different needs and requirements of people, community and country are analyzed which lead to the significant achievement of flexible design and architecture.

Flexible architecture has a long and interesting history. Our nomadic beginning and innate flexibility called for artificial environments that could keep pace with our life styles and accommodate our changing needs. It's the architecture that allows change periodically.

"Flexibility is not the exhaustive anticipation of all possible changes. Most changes are unpredictable. Flexibility is the creation of margin-excess capacity that enables different and even opposite interpretations and uses." –Rem Koolhaas
People are dynamic, progressive and adaptive. The spaces should be able to adapt our changing needs, expanding

population, tendency to migrate and fast-paced work oriented lifestyles. Flexible architecture addresses these concerns using a number of innovative design strategies, open planning concepts and modern technologies.

Architecture is all about creating spaces that triggers emotions and creates a sense of place which may be coined as ‘a friendly way of living with nature’. The neural satisfaction for being inhibited to a system and an urge to occupy it lifelong is the outcome of a real great architect. The prevailing aspects of the relationships provided by architecture that stands or exists today are of modern urban, rural and flexibility. Besides, global consumerism and mobility the other factors that have transformed architecture to movable, adaptable, transformable modes are the availability of steels and weldable materials, easily mountable riveted structures, screwable members etc. which help to stabilize system by use of optimized energy and resources from nature. Contemporary architects with their unconventional architecture are trying to adopt the existing system. Flexible building is a differential coefficient of various parameters of architecture and society that has come forth to serve different needs and requirements of people, community and country. The appealing and flexible technology in architecture seems to be quite importunate to modern architects and designers. Flexible design and architecture comprises a thought in a vicinity design grasps one’s notion and imagination to expand as directed by a range of purposes and utilization. Flexible architecture has inspired designers around the world with its singular characteristics of lightness, transience and practicality, the possibilities of portability, prefabrication, demountability, dynamism, adaptability, mobility of structures which is ever-growing.

2. CLASSIFICATION

Flexibility in architecture is viable through unlimited ways; regarding materials and finishes, outer skin, interiors, furnishing, partitions, structural members and many such elements. Morphing architecture is a tremendous section important to the architectural community today and has been arranged in a few different ways by various experts regarding the subject.

Interactive

In an architectural world *interactive architecture* positioned as a type of architecture that performs interaction between the building, people and appliances. The interactive design depends on the technological system employed in the creation of the interactive building in which physical interaction of environment is merged with people and interactive design, so that, the mind moves through abstract spaces.

Interactive architecture is an up-and-coming design field created by intelligent building systems that responds to users’ requirements in automatic or instinctive ways. It is architecture that is approachable to people’s needs to modify their environment and has mechanisms in place to do so easily. Sensors operate actuators that can activate a large range of actions – kinetic systems that physically modify space, services that alter the environment or materials that alter their state. When people become participants instead of users buildings “interact” and also when they respond to the user’s requirements in automatic or sensitive ways. Developing technologies contribute to the possibility of new and better constructional and operational strategies.

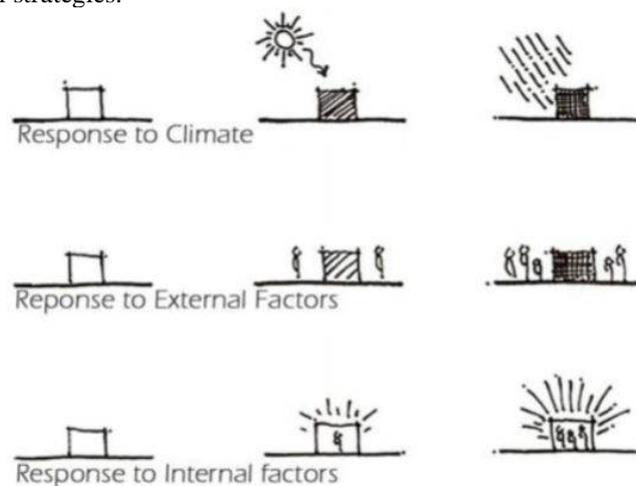


Figure 1

Adaptable

Adaptable structures highlight repositionable segments or are alterable per user/inhabitant. What epitomizes an all around flexible architecture is its simplicity of adjustment as per usage. These structures are regularly described by open floor plans and typology free design.

Charles Darwin said: “It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change” .One of the most significant lessons we can learn from nature is adaptability, it is ability to alter to changes or be changed to fit current circumstances.

Adaptable buildings are designed to regulate to the diverse functions, defined by users’ activities. Buildings, while having one distinct purpose, can operate for all kind of different others. It is architecture that sometimes is called *open building*, with loose-fit space that can be easily accommodated at the later stage. The *open building* strategy considered the most formalized strategy for adaptable architecture. The process of change can be continuous and ongoing, as it involves different participants to interact in the design of desired space and at different times of building existence. This process is seen as the most momentous attribute to adaptable architecture. The flexibility of the possible layouts gives freedom for users and inhabitants to choose own designer, and freedom for the designer to create the desired space the client needs.

Adaptable architecture also makes room for all the technological innovations that can improve the previous installations of the building. Such flexible updating in communication, security and other service systems allow changing layouts and functional specifications of the building. At the same time the technological advances allow for the creation of self-optimizing buildings, rather than merely best-fit compromises.

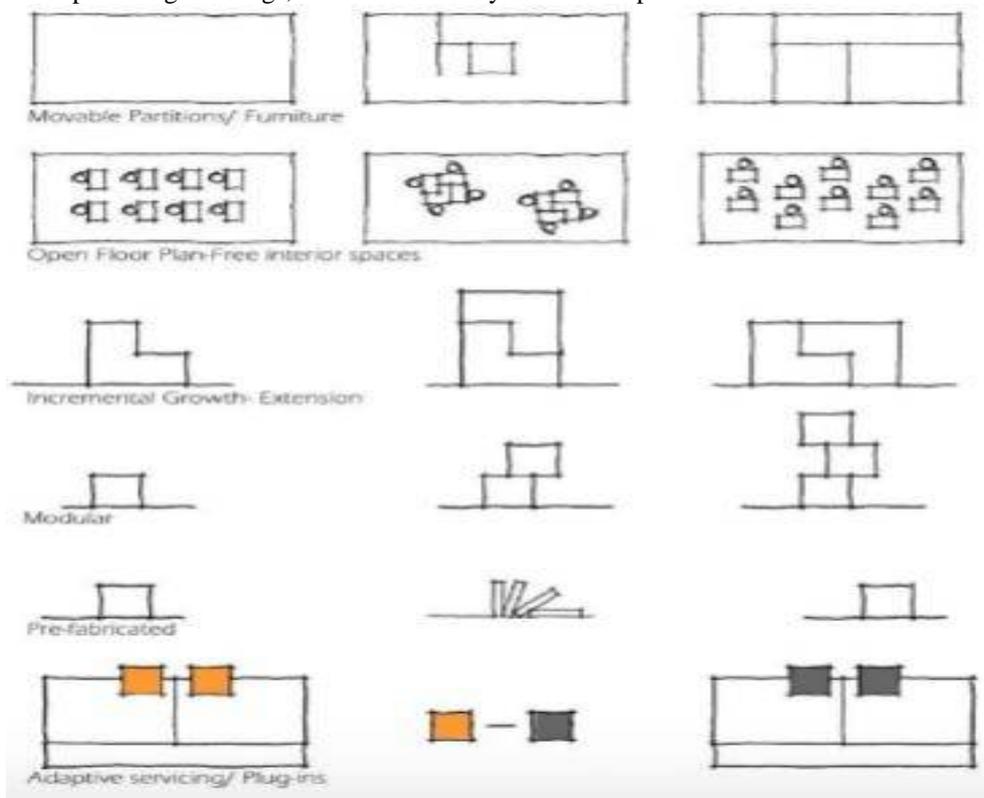


Figure 2

Adaptability in architecture is also recognised as an essential component in creating sustainable architecture. Preserving and adaptive reuse of a building instead of demolishing it and erecting a new one in its place contributes significantly to the environmental sustainability.

Buildings with adaptive systems use less energy, offer more occupant comfort, and feature better overall space efficiency than static building. Adaptable buildings are designed to be changeable, with multi-purpose space, freedom of use.

Facades that are programmed for change represent the process of creating dynamic spaces and objects capable of performing a range of pragmatic and humanistic functions. This type of architecture includes contribution from the world of architecture, industrial design, computer programming, engineering and physical computing.(Washington, February 2009)

Movable

Movable flexible buildings comprise of relocatable or repositionable structures or structures fit for being torn down and reassembled in another area consist.

“I’m for portable houses and nomadic furniture. Anything you can’t fold up and take with you is blight on the environment, and an insult to one’s liberty.” Andrei Codrescu here defines *Mobile architecture* as an architecture that represents physical movement, architecture that changes places within a time range. “Mobility” refers to buildings that can physically relocate from one place to another. Kronenburg describes mobile architecture as an architecture that “rolls, floats or flies”.

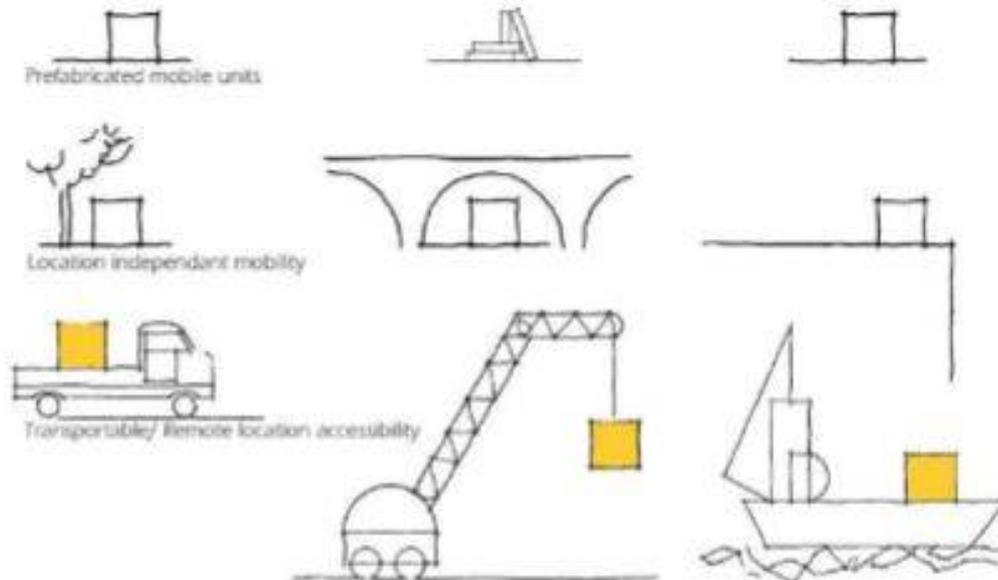


Figure 3

There's nothing new about mobile architecture. Nowadays there are still plenty of nomadic communities who take their dwellings with them. Mongolian yurts, Bedouin tents and American trailers are among the numerous examples. Many demountable buildings that are produced commercially today are already widely used in a number of fields – in commerce, industry, military, education, health care, housing, where they fulfil their individual roles.

Transformable

Portrayed by modular design (equipped for including or expelling units or segments) transformable structures can likewise open and close, change shape or change colour.

“I want to reinvent the built environment in order to extend the reach of consciousness.” In this way Michael Jantzen voiced his idea of transformation. Transformable buildings are able to change their shape, space, appearance by the physical alteration to their structural components, outer shell or internal surfaces. “Truly transformable architecture must enable a dramatic alteration in the character of the whole architectural environment. This is architecture that opens, closes, expands or contracts.”

Introducing transformation characteristics to a stationary building brings something magical about this performance – a building becomes kinetic at a touch of a button. By simple or more complicated operation building changes its form and gives the impression of being alive.

At the same time the transformation process may prove to be a challenging issue. The mechanisms used to enable movement have to be reliable, robust, maintenance-minimum, easy operable. Important features of mechanical movements of building parts are opening and closing joints. They have to be designed thoroughly to avoid any unexpected faults. New materials that help to maintain flexibility and integrity over prolonged time and new strategies employed by industries can help to solve this problem.

The important additional aspect of transformable architecture is ability of the building to interact with external environment and respond to climatic situations. Roofs, windows or other parts of the facade can be opened for example for light or closed for any other atmospheric reasons. This kind of control removes the barrier that buildings usually have between inside and outside, and again contributes to environmental sustainability.

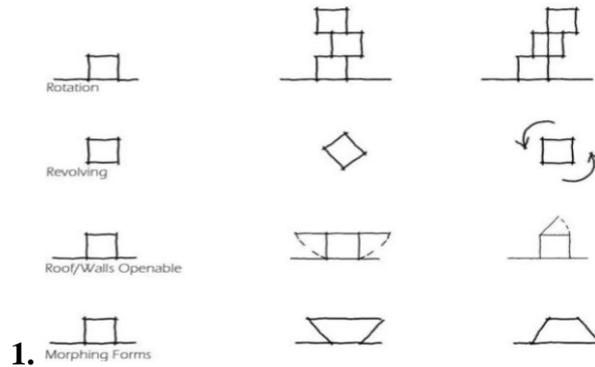
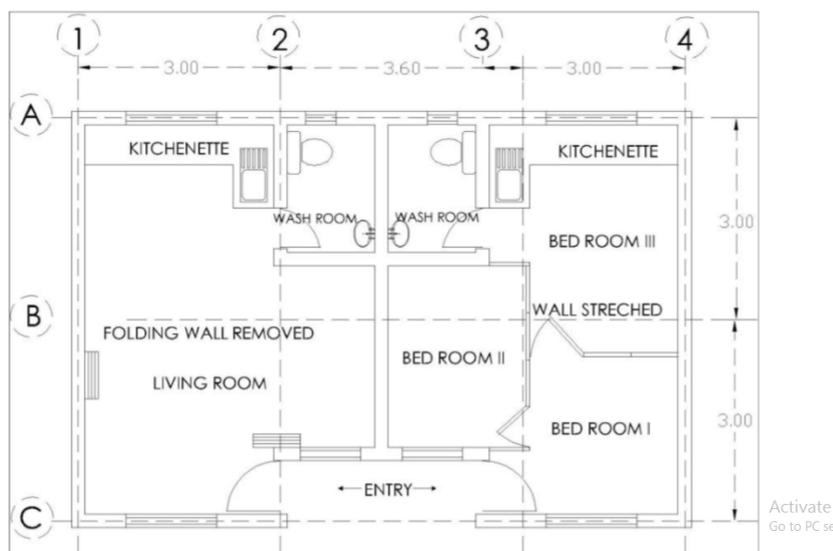


Figure 4

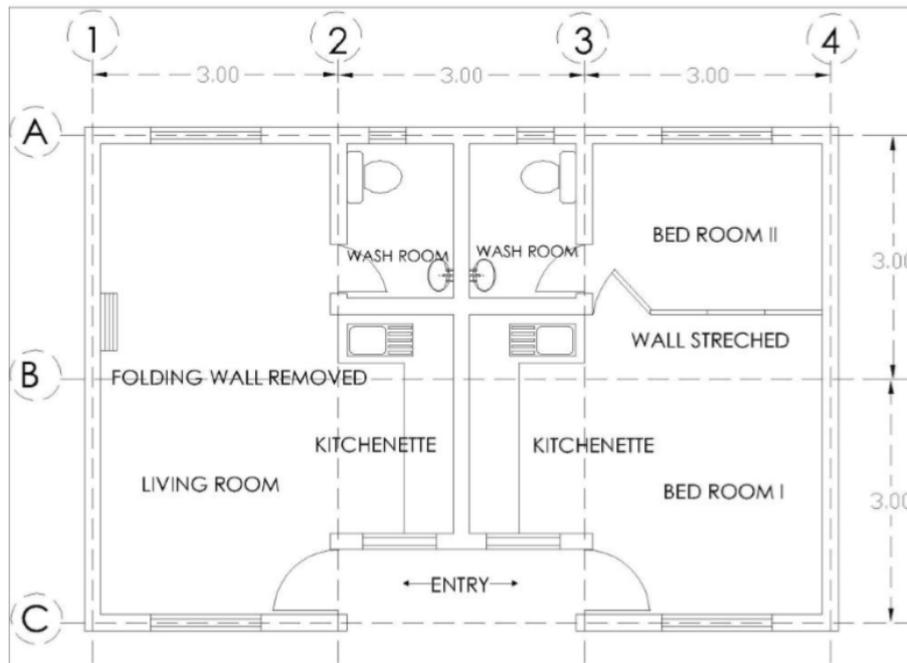
3. DESIGN FOR LOW INCOME GROUP

Before designing for the specific category families, small researches were done to study their living pattern as well as socio-economic and cultural requirements of lower income group population. The size of the family is usually four with two adults and two kids. Men of the families usually go out to work but most of the women are house wives, spending their day time with the neighbours helping each other in their daily household works. Also such families do have a small business to fulfil daily needs which they run from their houses only. They do need space for such activities. Any kind of solid furniture hampers their limited space for the work.

Design approach- This study on designing multipurpose flexible spaces has been done keeping in view the socio-cultural and economical requirements of Lower Income group living in the urban areas/cities of India. The apartments are designed to maximize flexible space for the family members to suit their changing requirements. The area of each individual apartment is 25 sq. m. with a centre line grid size of 3.0 x 3.0 m. considering the concept of modular co-ordination to make the spaces and components standardized to achieve a certain degree of economy. The 1bhk apartments have a flexible moving wall which can be stretched out during night time to separate living room and bedroom (fig. 1). This complete hall has an area of about 18 sq. m. which can be designed as per the needs of the resident. The planning of spaces is done such that during day the whole area can be used as a single space without any partitions in between. The entry to the apartment is through the corridor but is kept introvert for natural surveillance. And windows are provided on both the front and the back of the apartment for proper cross-ventilation. Kitchen is 1.5 x 2.7 m wide, enough for two people to work at a time. The wet spaces of the apartment are kept in the centre of two consecutive apartments, aligned to the rear wall to work out the cost efficiency as only one service core can serve both the apartment. The apartment is proposed as four storeyed (G+3) to avoid the cost of lift. The cluster can be arranged in any form suiting to the site conditions to form a good layout plan.



(i)



(ii)

Figure 1: PLAN OF MODULE (i) & (ii).

Activate Windows
Go to Settings to activate Windows.

The above two figures are the different flexible layouts that are possible for different types of requirements. Fig. 1(i) shows the plan of a layout. In this, the left part shows the flow in the apartment by providing full flexible space for multi-purpose use. Contrary on the right part it shows the use of same space at night time. Fig. 1(ii) show the arrangement of space by which 3 bedrooms can be carved out from the same space when required.

Cluster-Courtyard Planning The individual dwelling unit has been arranged in the form of a cluster having a courtyard in centre to provide people a comfortable living environment. The courtyard can be used as multi functional open space for the children to play, for parking vehicles as well as for organizing community meetings, particularly during day time by the ladies when the men are at their working places. The module designed has 11 apartments on each floor. A typical floor plan is given below (fig. 2). These apartments are arranged such that a courtyard can be developed within each block. This courtyard is planned to compliment the climatic aspect of India. India have both hot and humid climate. This courtyard helps in proper air circulation and day lighting in each apartment.

Furniture for the proposed apartment includes the folding bed, kitchenette and worktops which can be arranged in various ways. A variety of folding furniture is available now a day's which the residents can choose according to their requirements. Some of the common example of this type furniture is given below (fig. 3). Also the furniture which is readily available in market nowadays, designed to serve multiple functions at different times can be used.

5. CONCLUSION

The study has been conducted with a view to explore the concept of flexible living spaces and the folding furniture for domestic transformation. This concept although have not been followed in India for the lower segment of the society in urban areas but looking into the affordability of the targeted group of people and the scarcity as well as very high cost of land, the concept of flexibility will help in transforming the group to suit their changing needs and affordability. Although the study has been attempted to work out various flexible spaces suiting to the socio-economic requirements the concept may be tried on a pilot scale to validate the concept with feedback. Similarly, more research is to be carried out further for different income groups by studying their socio-economic and living patterns.

From this manuscript, it is thus concluded that Flexible Architectures connects us with the environment as per the demand of new era. It is effectively movable, sustainable, and transformable and can cater multiple activities in one space with emphasis on economical use of space, energy and resources. Flexible Architecture is capable of meeting world challenges such as mitigating the adverse conditions of climate change, serving high density of population, and creating sustainable communities which will help in regaining the natural environment and air quality of our mother planet.

REFERENCES

1. munin.uit.no
2. www.irbnet.de
3. issuu.com

AUTHOR



Monika Shekhar Gupta received the B.Arch. degree in Architecture from Madhav Institute of Technology and Science in 1998. During 1998-2020, she stayed in teaching profession in various institutes like Govt. Women Polytechnic, MITS , IHM Gwalior and finally in Amity University since last seven years. She is also persuing her Ph.D. from Jadavpur University ,Kolkata.