



APPRAISAL OF SPATIAL FLEXIBILITY PRINCIPLES IN THE DESIGN OF SKILL/ VOCATIONAL CENTRES

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ABSTRACT

In recent times, the growth of spaces to accommodate diverse functions and still maintain viability to accommodate future needs is one of the major challenges in architectural design. However, the flexibility to define architecture in some words is difficult. This is partly due to the opinion that each space has the potential of flexibility. The flexibility can be created by designing in spatial layout or choosing space users. The users of a space can use the space they have for their intended function. The need to use spaces for multiple functions has ensured that flexible spaces in skill acquisition centers are designed such that the spaces can easily be varied into smaller discrete and scalable size. Spatial flexibility is a term. Therefore, this paper brings into a limelight through secondary data analysis, the related article, and reviews the principles and necessity of keeping a space flexible and still attain its functions optimally.

Keywords, Spatial, Flexibility, Skill Acquisition, Adaptability.

INTRODUCTION.

Flexibility in the design of architectural space is a factor that can't be over emphasized as it is an inherent concept that encourages the futuristic functioning of a space. This is a related factor that helps to mitigate the functional obsolete nature a space can turn into. It is a norm that human activities change with time and season and as such, if designed spaces are not adaptive to the change that occurs in the human or inhabitant activities, it subjects that space and makes it vulnerable to being non-functional. Therefore, it is imperative that all design spaces possess the attribute to change with respect to the necessary post change.

This flexibility of space becomes more important when it has to do with spaces where machineries are in place. This is because they are technologically based spaces and it is well known that technological advancement changes more promptly with a drastic and obvious need for more space the year's approaches.

According to Stanislas (2018) he examine that flexibility in architecture, refers to the ability of a building to continuously adapt its space layout and even its structure to evolving needs. Achieving such "architectural flexibility" has been over the past century a challenge several investigations have tried to take up. From the early stage of the Japanese Metabolist movement, to the formal flexibility of contemporary architecture, architects have progressively enshrined the principle of space plasticity. But, all in all, they have rather turned it.

In addition, the modern movement, which was accompanied by advances in building structures, paved the way for designing an open plan for architect and subsequently became "flexible" to one of the most appealing words in architecture. According to Richard Rogers, the fundamental impact of the rapid changes on the physical form of the city, modern life can no longer be defined in the long run. As a result of this thinking, today buildings are not a symbol of static hierarchy; instead, they have become flexible spaces for use by a dynamic community. (Rogers, 1998).

Open Plane Feature Flexibility

With the advancements of the past few decades, the entry of a free platform into architecture with its main characteristics, continuity, transparency, interoperability, and differentiation and, in short, synchronization of locations, has been released. The flexibility of spatial features was released by the plan. Faces that are visual, coherent, distinct and transparent. It should be noted that space needs to meet the existing performance requirements, and each space requires its own specific feature according to its intended purpose. For example, space design and lighting conditions in a gallery must be different from one cinema and the materials of the floor in a gym should be different from a typical classroom. Thus, each space requires its own particular conditions and space flexibility cannot be considered without considering the performance of the rules. Creating a defective space is. The result without considering the same thing in the design of the flexible space. The English architect John Wicks refers to large projects, such as hospitals and airports, designed with a flexible approach. Projects that ultimately have become inadequate spaces with inefficient flexibility. (Weeks, 1963). Therefore, simply having

enough space and free plan cannot guarantee spatial flexibility. In other words, an open plan space is just a prerequisite for flexible space.

Unlimited Flexibility

Each function in the environment of its particular implementation environment and its specific requirements require performance. Henry Lefebvre, in the production of space, says, "Every function has a specifically defined space at the same point, which limits the possibility of more multiplication in a space. (Lefebvre, 1991) Also, Herzberg criticizes the maximum use of multi-functionalities in a space and considers it a space fragmentation factor. Simultaneous use of multiple functions in a space, each of which requires space and conditions during its execution, cannot be unlimited, and ultimately some functions in space are limited. Thus, in a given space, there is no elastic flexibility. Hertzberger, (1991)

Flexible Backup Building Systems

For a space to be able to meet the specific conditions of performance. Need to equip with suitable building systems such as lighting, audio, structural system, etc. In his "Last Apple" article, Koolhaas (1995) spoke of the close relationship between space and building systems and beliefs in the effective role of building systems in achieving spatial flexibility. In order to achieve flexibility, building technology can be used in conjunction with space design. But despite the influential role of advanced building systems in helping to achieve flexible space, it should not sacrifice spatial quality. Effective organization of spaces along with advanced technology can bring us into a flexible, high-quality environment and, in short, not advanced technology. It can be a factor in achieving optimal flexibility. (Koolhaas, 1995)

REVIEWS

Principles of Flexible Architecture

The first manifestation of the concept of flexibility is inherent in nature. Human beings, being an offshoot of nature are extremely flexible. They move about at will, they employ and choreograph objects, they function in a wide array of environments, determined to fulfil their desires. (Acharya, 2013) Buildings are exploited are exploited by different kinds of people in their own unique manners.

Their tailor-made spaces is evolving from space to place, from dwelling to home; and the period of use generates the unique essence of place that is necessary for established architecture to exist.

“Because the outside world of today affects us in the most intense and disparate ways, our way of life is changing more rapidly than in previous times. It goes without saying that our surroundings will undergo corresponding changes. This leads us to layouts, spaces, and buildings of which every part can be altered, which are flexible, and which can be combined in different fashions” – such stated Walter Benjamin necessity of flexibility in architecture. Flexibility became one of the important modernist terms. The concept of flexible architecture corresponds with the changes – in place and in time, in size/shape and in purpose, free of borders. Flexible architecture requires design which is shaped by attitude to integrate the requirements of the present with the possible changes of the future. Different situations, functions, patterns of use, individual users’ requirements for today and for tomorrow - these are main criteria that outline the design of flexible architecture.

Kronenburg (2007) identifies four key factors that characterize flexible architecture: **Adaptation, Mobility, Transformation, and Interaction.**

Adaptation

Nature is the greatest teacher of the concept of adaptability. “Adaptability is the ability to alter to changes or be changed to fit current circumstances” (Acharya, 2013) Adaptability in architecture is defined as an ability to recognize that the future is not finite, that change is inevitable, but that a framework is an important element in allowing that change to happen. Kronenburg (2007) Adaptable buildings programmed such that they adjust to the varied functions, defined by users’ activities. Buildings while having one distinct purpose, can operate for all kinds of variants. It is sometimes termed “open building” in architecture, with loose-fit space that can be easily accommodated at the later stage of its existence. (Acharya, 2013)

The process of adaptability in buildings can be a continuous process as it involves different users to interact in the design of desired space and at different times of the building's existence.

Adaptability in architecture is also recognized as an essential component in creating a sustainable architectural culture as buildings with adaptive systems consume less energy, offer more occupant comfort, and feature better overall space efficiency than static building design methods.

Element of Design and Form

Studying form and its relationship with space is so important because the elements are organized in groups and do not act as parts in space, but they define space that could be perceived through several relationships as (Oasim, 2005):

Shape and Background: The contrast between shape and background leads to strength form and can be considered a unique form in space, contrast case gives shape legibility, importance and identity within the space. **Continuity:** Continuous relations between elements through keeping same shape, colour, 198 Oday Q. Abdulpader, Omar A. Sabah, and Hussien S. Abdullah

Texture & pattern. Sequences:

Continuity of organized elements perception within space and ensure that any change will not cause any cut but increase effects and intense space. **Repetition:** A kind of sequence that can be achieved by repeating an element and gives more flexibility to space, repetition does not condition to be in shape and structure of interior space but can be in furniture and additional elements in space.

Rhythm: Sequence of repeated elements in certain periods within one composition.

Dominance: Giving more importance to one element within space, that can be possible by increasing size or selecting a focus point, etc.

Similarity: The repetition of one element around a point or axis, similarity provides order and legibility for elements that it contains and ease its perception.

Proportion: Proportion is one of the most properties that used in interior and exterior design and it is the basic reason that effects of form shapeliness perception, the relation between human and space proportion makes the space more efficient (M. & M, 2008).

Using Modular in design helps space to be more flexible and that causes easier and faster modelling and arrangement possibility of space. There is many definitions for proportion; some of them defined ratio as numeric quantities shapes mathematical relation between two objects or more among whole group parts, and the fracture formula used for expressing ratio like the ratio of length to width of rectangle, proportion in architecture is the consistency of architectural form dimensions and architectural elements among each other and between them and the whole architectural composition, proportion linked by functional, aesthetic and structural sides of architectural form as it helps of presenting the building certain architectural character and its compositional structure.

And it is a process aimed adjustment and balancing architectural composition by certain principles. At the beginning of architectural interactive architect usually cannot adjust proportion directly as he proceed the general logical composition counting on his experience and aesthetic sense then comes the adjustment of proportion and balancing the composition an advanced stage Ching & Binggeli, (2012).

Flexibility in spaces can be achieved through the under listed principle.

The principle of Repetition:

There are three levels (partial, whole, both) and it contain three main variables as follows:

Type of Repetition: As the previous studies there are two type the first one is Linear repetition (horizontal X, Y and Vertical Z) and the second one is Central repetition (round point, radiant).

Repetition's Method: Involving transformation in shape, size or direction. Ratio of Obviousness: Sometimes using repetitions in interior design lead to monotony, so the architect makes the repetition unclear to cover the monotony which causes of lost the repetition properties.

Proportion and Scale It's considered from the important geometric characters which related to flexibility. As the 202 Oday O. Abdulpader, Omar A. Sabah, and Hussien S. Abdullah adoption of non-standard ratios in the design of interior space leads to a wrong perception of space in addition to the difficulty of performing the function. It can make the space more flexibility through the adoption of measures to achieve a good fit for space and greater flexibility.

This involves three variables (numerical, fractional, and with scale).

- **Axiality:** The Axiality property has a real impact on applying flexibility, as it depends on the type of the increase in axial space or repetition in design elements without affecting the perception of form efficient functions, but could have a positive impact, and axial types are: linear, radical, point, and interaction Ching & Binggeli, (2012),
- **Flexibility:** The studies, which focused on the concept of flexibility can be the conclusion of some vocabulary which is on three levels (Partial, Whole, Both), which are two main types.

Furniture and flexibility are divided into (flexible furniture, flexible furniture with anthers, flexible furniture with the structure of space) and its impact on the aesthetics of the interior space. Flexible structure is divided into (horizontal flexible, vertical flexibility, flexibility in both directions) and its impact on the aesthetics of the interior space. Michael Hollander designed room with movable levels in New York in 1970 which considered from the first applicable idea. Another early idea was applied in residential building near Osaka around 16th-17th century by Shigeru Ban which named "Curtain Wall House". (Jones, 2001)

- Sustainability variables: Studies on the efficiency of space and the and sustainability can use the following variables:
 - Area savings.
 - Size savings.
 - Ability to adapt at using the space.
 - Materials savings.
 - Energy savings.
 - Division and increasing portability. Selecting the variable form is designed to measure the variables.

CRITERION ON FLEXIBILITY

There are with no doubt different basis on which flexibility rely below are some highlighted.

- **Efforts To Achieve Flexibility**
Efforts to achieve flexibility through the use of flexible equipment such as doors, sliding partitions or mobile platforms. The use of sliding doors can be seen in the traditional architecture of Korea and Japan. With the ability to adapt to the changing position of the space, these doors are closed to the wall to divide the space and in the open to connect the spaces.
- **Flexibility With Classification**
Hanieh, (2019) reviewed Roberk et al. (1974) where he pointed that a lot of historical forms implemented and concluded that the commonality of these centrally oriented forms is the existence of a kind of flexibility in their ambiguous planes. This flexibility is the result of user interpretations. They arranged the classification of some historical forms with this type of flexibility: The courtyards of Mediterranean and Mesopotamian households in Iraq where the courtyard is surrounded by rooms with different functions. The function of the yard in these forms is the circle of travel, which can be interpreted differently by the inhabitants

METHOD OF ACHIEVING SPATIAL FLEXIBILITY

The idea of flexible architecture has been in the field of architects' interests for a long time. It arose from an authentic need for movement, changes in lifestyle and constantly growing needs.

Nowadays, for a person who uses a portable computer and mobile phone, listens to music from the mini player, stores documents and photos in a virtual cloud, and for lunch eats instant soup - mobility of objects is everyday life, and the mobility, adaptability and flexibility of buildings is just another step in the same direction. Varied methods exist upon which flexibility can be achieved in architecture and these will be discussed below:

- a. **Flexibility by Operational Elements:** This is the most direct solution for the flexible of space. Building elements such as doors, sliding or movable partitions, and moving partitions, platforms are adopted in the design for flexibility.

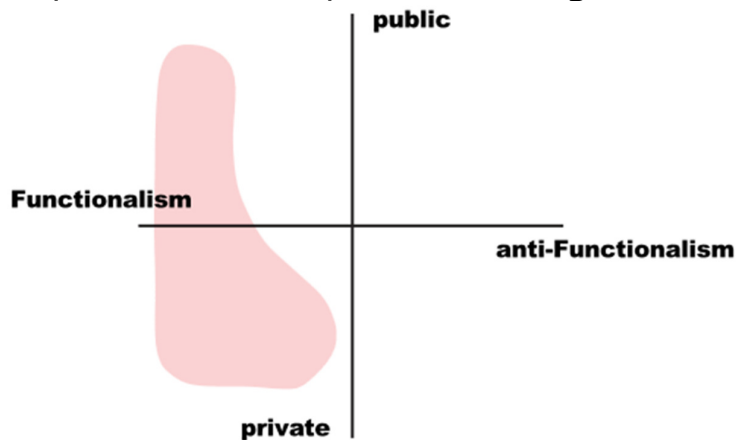


Fig. 2.14: Domain of influence and relationship – inclined to both functionalism and privacy in design solution.

Source: Kim (2008)

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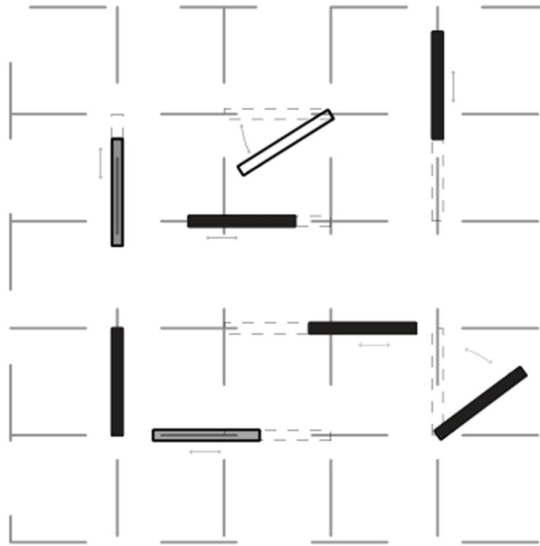
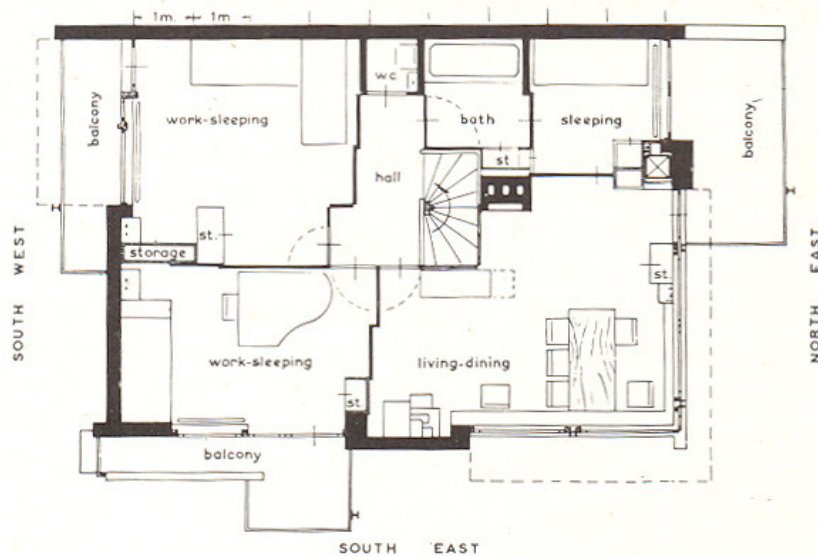


Fig. 2.15: Gridded space using movable doors and partitions – creation of infinite combination patterns for arrangement of space based upon function
Source: Kim (2008)

Schroder House designed by Gerrit Rietveld in 1924 consists of large open plan with locating fixed elements like bathroom and kitchen at the house' external walls. Internal partitions from the house external wall to the central staircase provide various possible plan layouts.



52. Schröder House, plan, upper floor, closed

Fig. 2.16: Schroder House plan, Upper floor – Closed layout
Source: Kim (2008)

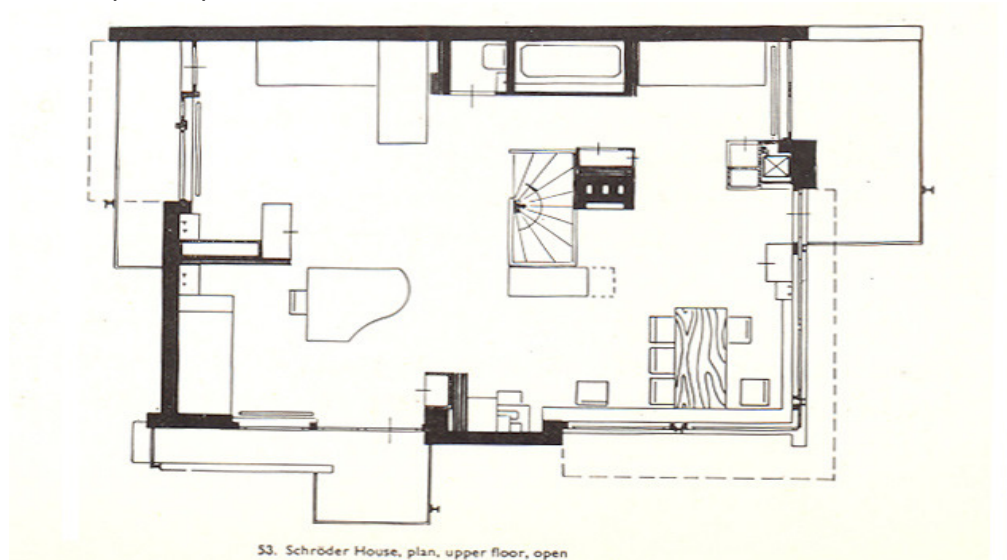


Fig. 2.17: Schroder House plan, Upper floor – Open layout
Source: Kim (2008)

The traditional Korean residences are typical examples of modularity by element where movable partition walls and sliders serve the function of demarcating and expanding the use of a space depending on the intended function.



Fig. 2.18: Lift-up sliding door in the Korean traditional architecture
Source: Kim (2008)

Also, the 'Fun Place' by Cedric Price which was a design proposal for an avante garde performance space inspired by Jean Littlewood, a veteran of the English theatre scene. Little wood desired a theatrical space where her performance could be uncontrolled and unconstrained by a built form. This motivated price to design an infinitely flexible, multi programmed entertainment center with technologies and industrial elements that created a unique environment for the theatre and for Littlewood.

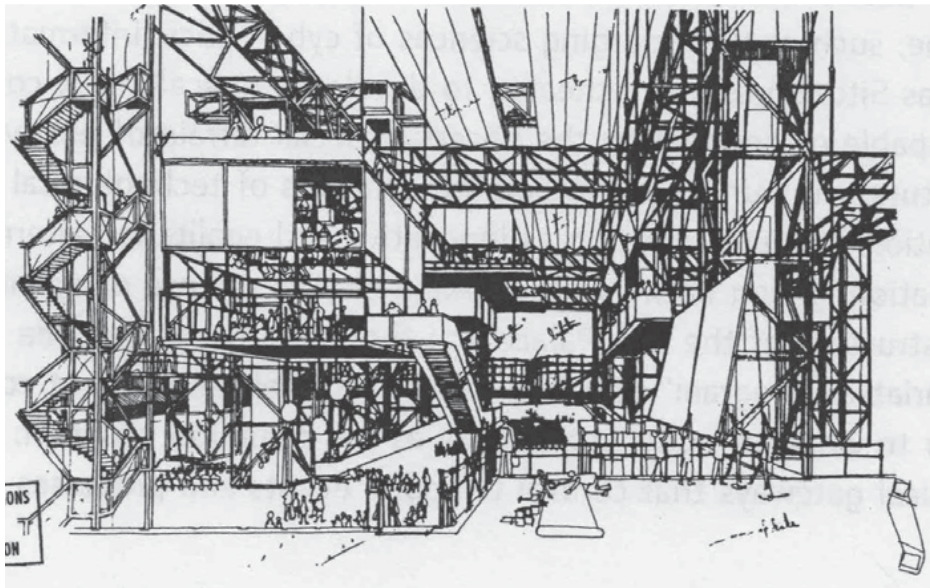


Fig. 2.19: Fun place by Cedric Price
Source: Kim (2008)

- b. **Flexibility by Modular Systems:** This is a system of using modular elements and components such as building elements (floor finishes, ceiling finishes, door and window components, roof members) Furnitures (tables, chairs, beds, etc). Flexibility in this case is achieved through interchangeable units and via the designer's intentions as well as users' modifications. This system creates the advantage of easy replacement, reshuffling, addition and other types of iterations.

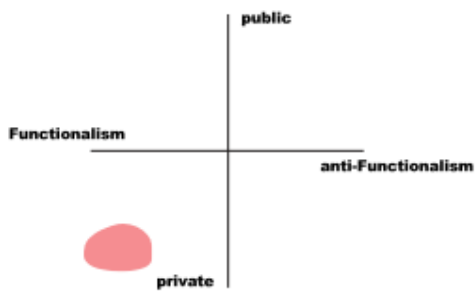


Fig. 2.20: Domain of Influence distributed in Grid space
Source: Kim (2008)

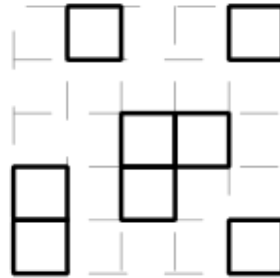


Fig. 2.21: Modular spaces
Source: Kim (2008)

- c. **Flexibility by Arrangement of Spaces:** The flexibility is attained by zoning, which condenses functional systems and allows users to use the rest of the space as they deem fit. The flexibility is achieved through designer's intent and end user's adaptation.

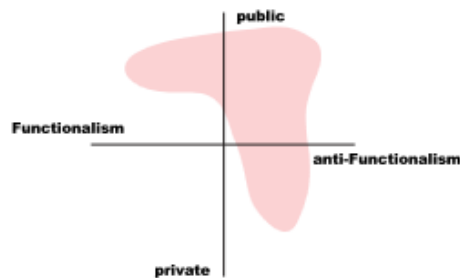


Fig. 2.22: Domain of Influence condensed
Source: Kim (2008)

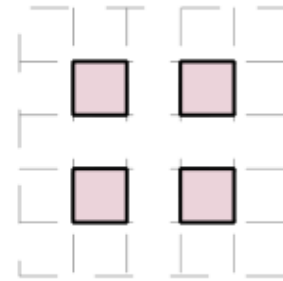


Fig. 2.23: functional core

Source:

- d. **Flexibility by Personal/Public Adaptation:** This pertains more to the urban context and is more sensitive to spatial properties such as size, lighting, material, and others as opposed to personal adaptation due to the high tolerance of personal adaptation to public adaptation. The flexibility attained by users' adaptation is based upon given conditions.

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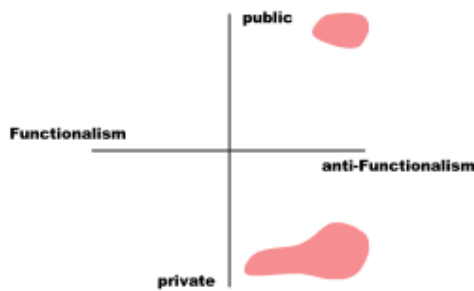


Fig. 2.24: Domain of Influence
Source: Kim (2008)
depending on set conditions

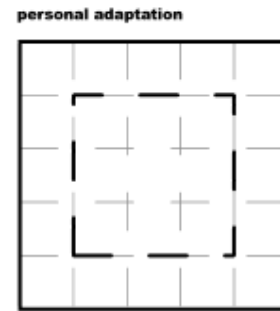


Fig. 2.25: use of partition to adapt
to varied functions
Source: Kim (2008)

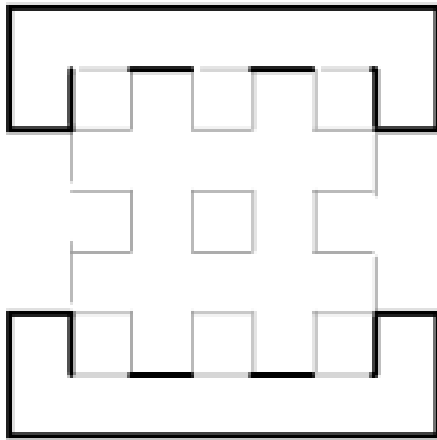


Fig. 2.26: Open ended spaces – Public adaptation
Source: Kim (2008)

- e. **Flexibility by Erasing Programs and Hierarchy:** Flexibility is achieved by non-hierarchical spaces as there is no obvious building up of interest in arrangement of such spaces. Also, the plan is almost reduced into some geometrical pattern in accordance with different use scenarios. This is expressed in open floor plan layouts where uses are filled based upon condition and is subject to change and adaptation as needs emerge.

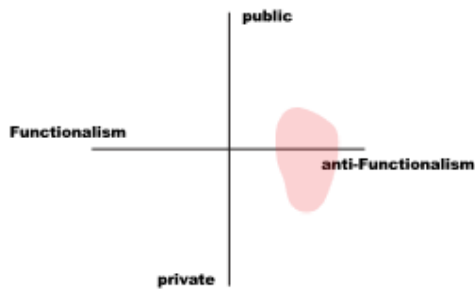


Fig. 2.22: Domain of Influence
Source: Kim (2008)

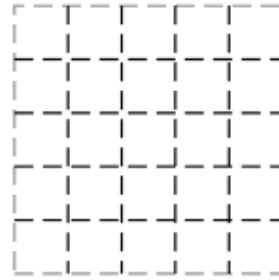


Fig. 2.23: open planned layout
Source: Kim (2008)

CONCLUSION

The flexibility of design are key factors that can't be undermined. Given adequate consideration in from the conception of every designs about the how flexible a space can be giving a functional outcome of the design. Adopting the basic design principles which will usually affect the form, and how open the space can be will give room for multi usage in future. Spatial flexibility in other words is recommended as it mitigate the any design from undergoing functional obsolescence.

This paper is recommended to serve as a manual for creating spaces that are very much necessary for future expansion and uses through imbibing the basic principles.

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