

The Importance and Necessity of Flexible Spaces and Buildings in Nigerian

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Abstract

Building adaptation has a limited time perspective; suited premises need to change over time in order to keep up with the processes in using a building. In an ideal situation, owners, clients and users, based on a demand for effortless adaptability, would be able to transform the building when it is needed. This puts high demand on the flexibility in a building, i.e. adaptability. A well-structured questionnaire which data were analyzed using the mean value and simple percentage were used to find the importance of creating flexible and adaptable spaces and buildings in Nigeria. Most structures in Nigeria are left out of use or abandoned for a long time due to the fact that they were designed as a single use spaces or buildings which has made it difficult for them to be converted into a multi-use spaces that could effectively and efficiently serve other purposes. Hence to ensure optimal use of spaces and buildings gave rise to the idea of flexibility and adaptability for multifunctional and multi-use buildings and spaces which implementation in construction should start right from the conceptualization and design stages.

Keywords: Flexibility, Multi-functional, Design, Buildings, Spaces, Adaptability, Architecture.

1. Introduction

As populations concentrate in cities and exhaust available land, housing flexibility becomes a significant feature in the transformations of our daily lives. Associated with different typologies, housing flexibility offers the possibility of spatial or structural modification of buildings to meet user requirements by accommodating technological, cultural, and economic changes that occur over time. Housing flexibility is based on extending construction lifespan (avoiding obsolescence) and sustainable consumption that conforms to recycling and waste management. Therefore, flexibility allows buildings to be useful for a long period by means of adaptations that guarantee continual utilization. A typical example is the High Line in New York City incorporates public art and programs, local vendors, community spaces and the natural environment into a public park that is visited and used by thousands of people each day, residents and tourists alike. The concept of flexibility is covered by the recent architecture, although it is not a recent term.

The term “flexibility” entered the field of architectural terminology around the early 1950s. The concept of flexibility is an important concern in the design of housing. Flexibility refers to the idea of accommodating change over time. Thus, flexible housing corresponds to “housing that can adapt to the changing needs of users” (Till & Schneider, 2005). Flexible housing can also generally address issues of sustainability. Providing environmental sustainability can be an important feature of flexible housing design. Flexible houses have multi-functional character and various functions can be accommodated in a limited space, they save energy and materials for housing construction. On the other hand, flexible houses are adapted to the household's changing needs and wishes due to the lifestyle and market changes, and thus they have a long life span. These features provide environmental sustainability (Beissi, 2001).

A multifunctional building is one which is designed to serve multiple purpose/activities. i.e. a multi-functional building comprise of multi-functional space. The spaces are not designed to accommodate an exclusive purpose instead they are designed as flexible functional space to accommodate different activities at different occasion. For example, a building which can function as an exhibition hall, banquet/ convention hall, indoor games complex, ball room, library, community house etc. so the purpose of the space is not strictly defined in this case. It can adopt different activities/use as per its demand. In other words a multifunctional building can be described as a true integration of different functions in a same space but at different time. Pragyana (2016).

Hertzberger (1991) in his book entitled *Lessons for Students in Architecture* defined “flexibility” in the housing context as the capability of proposing different solutions for diverse uses with no certain single solution but most appropriate solution.

He discussed flexibility in a different perspective by introducing the term “polyvalence”. Maccreeanor (1998) supported the argument of Hertzberger:

Flexibility has for a long time been a subject of interest for architects. In the years to follow this resulted in many buildings with open, changeable planning around fixed service cores. One conclusion is that flexibility doesn't simply imply the necessity of endless change and breakdown of accepted formula. On the contrary, the buildings that have proven to be the most adaptable were those not originally planned for flexibility. (p. 40)

All above descriptions refers flexibility to capability of changing condition by altering the physical fabric of building. So, flexibility is related to both structural system and service spaces as well as the physical changes in the interior spaces. Flexibility is the possibility for spaces to be used in a different ways without changing the building fabric. Based on the shell and core principle, the spaces can be used flexibly in a variety of different ways according to need.

Flexibility is related to social performance of psychological, economic factors and over time, with changes in the urban and rural, family, and daily and seasonal habits of people and changes in the activity of the population becomes the most important principle. So the physical space of the building must conform to the cultural, natural and man-made environment, and environmental, economic, social, political and community livelihoods. (Tayebeh,2015). However, a consensus on the essence of flexibility is clearly revealed, which can be defined as: the pre-arranged response to change. The change can be pre-occupancy (according to the users' personal preferences) or post occupancy (as response to the inevitable obsolescence after many years); it can be generated by physical factors (such as the degeneration of the facade and pipelines), or non-physical causes (i.e. The shifts in lifestyle); it may be a common transformation which happens in a wide range (for example the increased size of living space which was found all over the state), or an individual activity (i.e. The re-division of interior space for a new family member); it may occur with comparatively low frequency (for example, the universal change of interior layout in China takes about ten years), or with high frequency (i.e. The shift of specific uses within a year, a week, or even a single day); it probably has to be achieved by constructional approaches

(some partitions need to be removed), or non-constructional method (i.e. By the simple re-organization of furniture) (Li, 2015).

2. How the Space Affects Function

People always take place within a space in their daily life; this is the reason people design the spatial environment according to their needs, whether a landscape, a city, a house, a room. Space which is not looked at through a keyhole, not through an open door, space does not exist for the eye only; one wants to live in it. The purpose of a space is the main consideration for designers before they start the plan. It is a complicated factor which affects the final layout of the space. A site is influenced by many complex and diverse factors. There are different architectural contexts and each determines the type of building design. The scale between space and architecture, especially the most standard occurring sizes, is determined primarily by the structural usage, and is always perceived in relation to human scale and the adjacent spaces. People are affected by the relative perception of spatial scale effects. Architects and planners have developed some systems over the course of the architectural history, all which refer to human scale; one of the most recent is Le Corbusier's "Modulor".

3. Classifications of Flexibility

Beside various definitions, many authors categorize flexibility in different forms to clarify the conceptual framework of the study better; some of the classifications will be investigated. The first classification is for Dittert (1982), He classified flexibility into two groups: Functional flexibility and structural flexibility.

In 1990, Van Eldonk & Fassbinder. Added one group to the Dittert's categorization, which was "Character flexibility". So the outcome of this categorization became as below:

- (a) Spatial (structural) flexibility: This flexibility is not only related to structural changes but also to the physical alteration occurring in the interior space. Dwellers can change their houses according to their own preferences based on professional intervention. Jamal, E-Din Mahdin (2016).
- (b) Functional flexibility: the ability to change the condition without professional intervention. It is based on assigning new functions in redundant rooms, changing the room function or the relation between the rooms. Jamal, E-Din Mahdin (2016).
- (c) Character flexibility: possibility of changing the façade or dwelling identity aspects of architectural quality. It is aimed to clarify this classification. More, many authors tried to determine some notions for each category. According to Al-Dakheel (2004), and

Gulaydin (2004) quoted in Bakkalolu (2006) added more detail to each category. In the works of Hofland (2005), there are different types of flexibility. These are:

1. Neutral for furnishing, (functional).
2. Possibility for change of floor plan, (structural).
3. Possibility to reshape apartments, (structural).
4. Modernization flexibility, (structural and functional).
5. Character flexibility (identity), (cultural).
6. Flexibility for changing safety requirements, (functional).
7. Wheel chair adaptability, (functional).
8. Capacity for expansion, (functional).
9. Multi functionality, (functional).
10. Parking flexibility, (functional), Hofland, (2005).

Flexibility will be in three species: diversity, versatility and variability. Variety of space to have the concept of multi-functional space fits the needs of the possibility of changing space. Adaptability is the functional flexibility and performance of a space in which mobility across sectors and regions is proportional to the time and season. (Mirzade, 2013)

A number of principles have been tried to achieve flexibility, including:

- a) the use of transformable furniture which encourages the multi-functional use of space by enabling one set of furniture to be folded away, as another is pulled out eg a fold-up bed goes away as a fold-down desk appears;
- b) Non-function-specific spaces are designed that can accommodate domestic or non-domestic use; these functions can change over time;
- c) Sliding doors are used to close off private areas when members of the public visit; when the building is in purely domestic use, these are opened, transforming the spaces;
- d) In addition, spaces can be transformed from domestic to non-domestic by shutting away elements of a room, such as kitchen units, that make it specific to a particular

3.1 Flexibility and Modularity

The main feature of a flexible design is that it is adaptable. Flexible design distinguishes between the load-bearing structure (structural framework and floors), the facades and installations.

Flexibility must be seen as a proactive attribute designed into a system, rather than a reactive behaviour. Edmonds and Gorgolewski (2000) for example, view buildings flexibility as

incorporating, at the design and construction stage, the ability to make future changes easily and within minimum expense to meet the evolving needs of the occupants.

General design approaches to increasing flexibility and more specific design strategies are also distinguished. The approaches proposed include physically separating the major building systems into smaller (modular units) and prefabrication.

The design strategies include reduce inter-system interactions, reduce intra-system interactions, use interchangeable system components, increase layout predictability, improve physical access, dedicated system zones, enhance system access proximity, improve flow, phase system installation and simplify partial/phased demolition. Because modular systems are designed with flexibility in mind as component units rather than a solid or monolithic whole, it thus goes to give that they aid building flexibility.

The basic issues that this journal attempts to expose, is the importance and necessity of space flexibility and adaptability in a multi-functional and multi-use buildings to solve abandonment and under use building problems in Nigeria. In an attempt to address these issues architecturally, the basic principles and concepts of flexibility, adaptability and multifunctional approach are being employed to give a lasting solution.

4. Research Methodology

The deductive method of research involved in the collection of data from both primary and secondary sources. The sample for the study consists of 52 persons randomly selected from real estate and construction industries. The questionnaires items were self – report interest inventory (SRII) checklist and the subject or people responded to the SRII items on a five (4) point scale of strongly agreed (SA), agree (A), disagree (D) and strongly disagree (SD). They were structured basically to seek the opinion of the respondents so as to have logical yardsticks to` accept or reject our research hypotheses. The responses were analysed using statistical tools (mean and pie chart).

4.1 Research Questions

The research questions used in this study are as follows:-

1. Is lack of space and building flexibility concept the reason for many abandoned single use spaces and buildings in Nigeria?
2. Is clients' or users' preference responsible for lack of flexibility in Nigerian buildings?
3. Is government policies and implementation responsible for lack of flexibility in the design of Nigerian buildings?

5. Research Results

Question 1: Is lack of flexibility concept the reason for many abandoned single use spaces and buildings in Nigeria?

Table1: Lack Flexibility Concept as a Reason for many Abandoned Single Use Spaces and Buildings in Nigeria.

S/N	Statement	SA	A	D	SD
1.	Nigerian architects lack patience in designing a multi-use building	-	30	12	10
2.	Over dependence on old fashioned ways of designing buildings.	7	38	12	5
3.	Nigerian architects are not properly exposed to modern building concepts	15	12	22	3
5.	Lack of creativity in designing buildings.	19	15	10	8
	Total	34	95	56	26

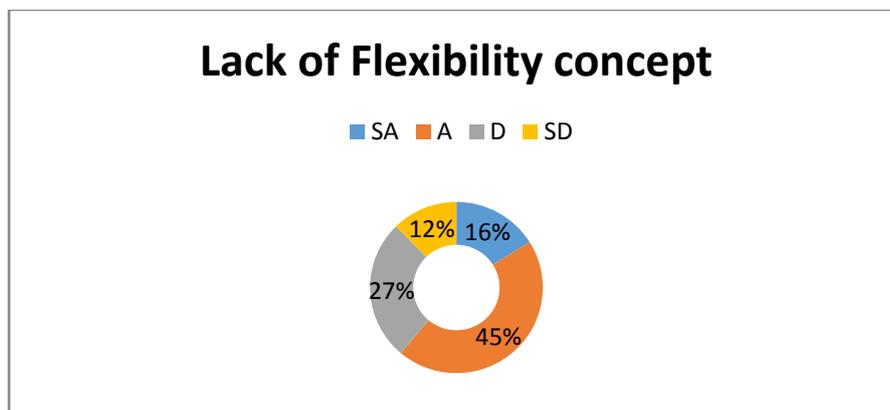


Figure 1: Pie Chart Showing Lack Flexibility Concept as a Reason for Many Abandoned Single Use Spaces and Buildings in Nigeria

Question 2: Is clients' or users' preference responsible for lack of flexibility in Nigerian buildings?

Table 2: Clients' or users' Preference as a Cause of Lack of Flexible Buildings in Nigeria.

S/N	Statement	SA	A	D	SD
1.	Clients prefer single use buildings to avoid high bills.	20	15	7	10
2.	Clients prefer using quakes.	21	14	12	5

3.	Clients prefer cheap construction and material cost because of low budgets	16	23	10	3
	Total	57	52	29	18

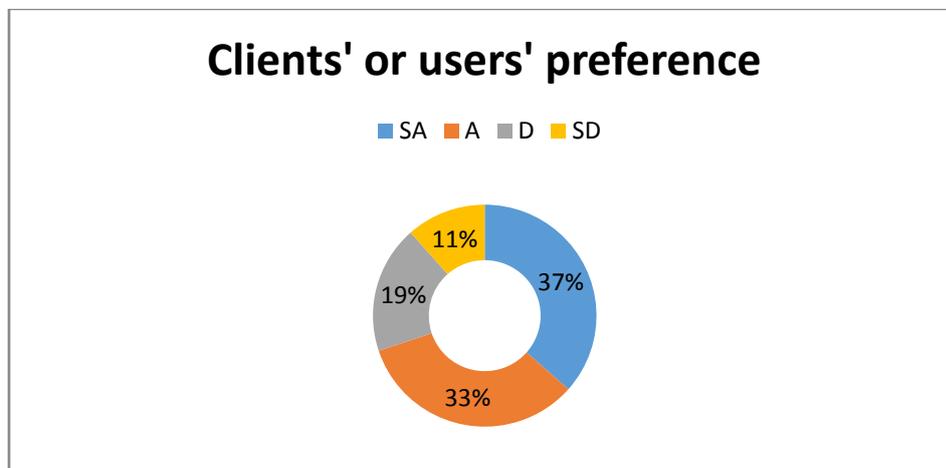


Figure 2: Pie Chart Showing Clients' or users' Preference as a Cause of Lack of Flexible Buildings in Nigeria.

Question 3: Is government policies and implementation responsible for lack of flexible spaces and buildings in the design of Nigerian buildings?

Table 3: Government Policies and Implementation as a Factor that Contributes to the Lack of Flexible Spaces in Nigerian Buildings.

S/N	Statement	SA	A	D	SD
1.	Unfriendly political environment responsible for lack of flexible buildings in Nigeria	2	21	24	5
2.	Unavailability of locally sourced materials responsible for less flexible residential buildings	12	18	15	7
3.	Land use act as one of the impediments to building flexibility in Nigeria	3	22	21	6
4.	Poor implementation of policy is responsible for less flexible spaces and buildings	14	20	8	10
	Average	31	71	68	28

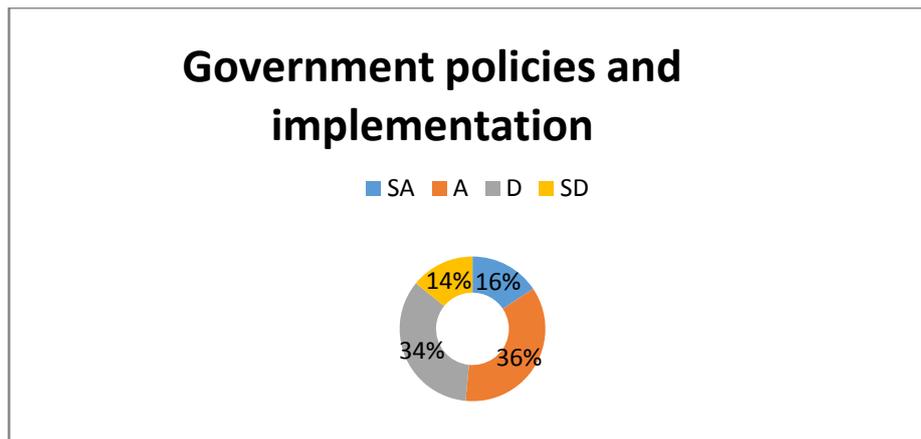


Figure 3: Pie Chart Showing Government Policies and Implementation as an Impediment to Flexible Housing in Nigeria

6. Discussion and Analysis

From the theoretical frame work spatial/ structural flexibility is more concerned with professional interventions as a way to change the conditions of a building with the aim of satisfying different users; it depends on physical and structural features of the building. The change based on size and situation which gradually increases the need for more activities and events, to separation into multi-functional spaces. Horizontal, vertical and furniture flexibility arrangements layout are observed due to modularity. In some cases, due to existence of larger and regular configuration of spaces, technically it is possible to divide it into different spaces for variety of activities to be performed. In building scale, structural system of the spaces should be considered as like as any other common buildings.

From table 1, it shows that 72% of the respondents agreed that lack of flexibility concept among Nigerian architects contributes to lack of flexible spaces and buildings in Nigeria while 28% disagreed. Over dependence on the old-fashioned load and non-bearing walls which has sand screed hollow block, the possibility of converting the structure to multifunctional building is restricted. not being flexible in the use of building materials. For a building to end up flexible, it starts from the design phase of the building before it is erected and Nigerian architects lack creativity in their designs.

From table 2, it shows that 70% of the respondents agreed that clients' or users preference is one of the main cause of lack of building flexibility in Nigeria while 30% disagreed. This agrees with Israelsson and Hansson (2009), they demonstrated that although all flexibility factors are important, several aspects have a greater value than others in housing design.

Human factors, such as personality, relationships, and individual interests, are additional determining conditions and involve decision makers and residents.

From table 3 and figure 3, it shows that 70% of the respondents agreed that government policies and implementation contributes to lack of flexible buildings in Nigeria while 30% disagreed. The respondents were of the opinion that the post independence era in Nigeria which is characterized by unpredictable political atmosphere has a lot of deleterious effect on flexible housing provision in this country. Due to the nature of party politics in the country public housing programs in the country were conceived of as political projects used by ruling political parties and groups to secure political patronage from the citizens and reward political loyalists by locating and awarding contracts for housing projects on political basis. As a result, many state governments and their agents were not willing to provide adequate support to the implementation of some housing programs initiated by federal governments that were not of the same political party as theirs. Hence, such schemes were not properly implemented, and in some cases were abandoned. Ibemet. al. (2011).

Also regarding the unavailability of locally sourced materials, Gichunge (2001) and Kadiri (2005), which revealed that the problems of local materials comprise non-inclusion of some of them in National Building Codes and lack of governments' support. Inadequate funding can also affect quality, which can be solved by government through provision of access to funds, tax reduction and incentives (Olayiwola et. al. 2005). Producers currently spend a lot of money in generating electricity and other needed resources in Nigeria. If government can produce these infrastructures, the producers can transfer the money toward improving quality. Also what will readily come to the minds of the players in the housing subsector when unsustainable policies and legislation is mentioned is the 1978 Land Use Act. This Act has been one of the impediments to housing flexibility in the country.

6.1 Factors that Affects Building Flexibility

The factors that affects are divided into 2 groups, which are;

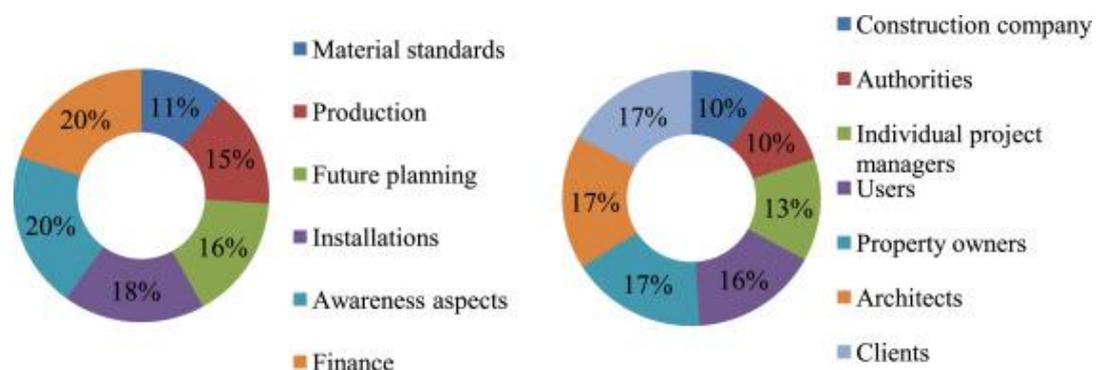
1. **Flexibility Factors:** flexibility factors were divided into hard (with a direct effect on flexibility level) and soft (with no direct effect) aspects. Awareness, finance, and future planning were classified as soft aspects. Installations, production, and material standards were classified as hard aspects.
 - a. Material standards
 - b. Production
 - c. Future planning

- d. Installations
- e. Awareness aspects
- f. Finance

2. **Decision Makers:** in the design phase, building projects are mostly affected by political decisions, which subsequently affects decision making and flexibility in buildings. Political decision also positively influences construction risk management within the organization, by which some companies are politically connected to one another. The decision makers include;

- a) construction company
- b) authorities
- c) individual project managers
- d) users
- e) property owners
- f) architects
- g) clients

The two factors that affect space flexibility the most are awareness and finances. The correlation between the two factors is remarkable because lack of awareness on flexibility advantages leads to the misuse of financial resources. Interestingly, clients, users, architects, and owners have an equivalent weight in decision making.



Flexibility factors/decision makers. *Source:* Israelsson and Hansson (2009).

It was discovered that in the design phase, building projects are mostly affected by political decisions, which subsequently affects decision making and flexibility in buildings. Political decision also positively influences construction risk management within the organization, by which some companies are politically connected to one another.

Durability and lifespan of materials contribute most to the use of local building materials. This is followed in descending order of contributions by cost of production, reusability of materials, public awareness, government intervention, renewability, availability, manpower, good aesthetics, social acceptability, sound insulation, embodied energy capacity, water reduction and air quality properties. The finding confirms the assertions of several researchers that the use of local building materials will reduce construction cost and enhance affordability of houses (Olayiwola et. al. 2005; Akeju, 2007; Erguden, 2001; Dominiaku&Obiozo, 2010). It also explains the reason for low and non-usage of local materials because many of them are not durable. Appropriate technology should be employed in the production of local building materials. This agrees with the opinion of Gichunge (2001) who indicated non-availability of technology as a constraint of local building materials in Kenya. Adedeji (2005) also indicated that local building materials are underdeveloped and hence are socially unacceptable.

6.2 Recommendation

As a way of introducing flexibility in the designing of Nigerian buildings, the following are recommended: Nigerian Government incorporate policies that would encourage the design of flexible and multifunctional spaces, in Nigerian buildings especially public spaces, legislation against the use of quakes and technicians in place of architects, introduction of policies that states that owners whose buildings are empty for longer than half a year, have to report their buildings to the local government or pay a fine/penalty, reorientation and retraining of architects on the importance of flexible buildings and Proper environmental Impact Assessments in choice of location for such multifunctional buildings or spaces.

6.3 Conclusion

Making public spaces flexible and multifunctional for other uses on the other hand will not only ensure availability of spaces for other activities but will save the authorities lots of tax payers' money in erecting newer structures. The study of the existing situation, analysis different case studies and other materials brought about the inspiration of the concept and design of flexible and multifunctional spaces that is more functional and sustainable for a dynamic society.

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