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INTEGRATION OF FLEXIBLE DESIGN TECHNIQUES IN THE DESIGN OF A MIXED-USE BUILDING TOWARDS ADDRESSING DEVELOPMENT CHALLENGES IN ABUJA

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ABSTRACT
As the needs of owners and residents change, buildings often need to be refurbished, resulting in high costs during construction, operation and maintenance with loss of functional use of the building. Most new building projects are focused on a specific program for which they are perfectly meant for. However, in this era of economically challenging times we need buildings that can easily adapt to changes in the market in order to prolong their durability. Combining living and working gives a lot of planning problems because, both the two functions compliments one another in the use of qualities spaces. In addition, the usual cycle of building and demolishing buildings is now becoming a big problem which needs strategic solutions. Hence, this study develops a systematic approach to study and analyze the properties of expected changes in the facility constructed and specific design strategies that may increase significantly the flexibility or ability to adapt to changes in the building. Therefore, three types of changes to the building are in its function, the capacity of the system, and the environment and flow of people in and around the building. These design strategies can provide specific means to change the interactions between the functions, systems and environment which will effectively and efficiently compensate for changes during refurbishment, later. It was recommended that these design strategies will increase the initial value of construction costs average less than 2%, usually reducing the original construction time.

KEYWORDS: Adaptability, Approach, Flexibility, Mixed-used and Strategies

INTRODUCTION
Throughout human history, the majority of human settlements developed as mixed-use environments. People lived in close proximity to their work, Walking was the primary way that people and goods were moved about, sometimes assisted by animals such as horses or cattle, (Caleb Sackey, 2009). One of the Urban Design Principles which cuts across many

urban areas around the globe is the principle of mixed- use development. Mixed-use development is the practice of allowing more than one type of use in a building or set of buildings. In planning terms, this can mean some combination of residential, commercial, industrial, office, institutional or other land uses. This tends to create shorter distance between work, residence and recreation and goes a long way to enhance the livelihood of the inhabitants. A mixed-use development is a real estate project with planned integration of some combination of retail, office, residential, hotel, recreation or other functions. It is pedestrian-oriented and contains elements of a live-work-play environment. It maximizes space usage, has amenities and architectural expression and tends to mitigate traffic and sprawl. Based on the variations that exist in the various mixed use developments, it will be unfair if measures were not put in place to handle the various ways information are collected. In the light of this various sampling procedure will be employed in the collection of the data. Specific sampling techniques were used to select the various mixed use developments. This will be done through holding interviews with occupants of mixed used developments and developers, studying movement patterns of residence of single use suburban developments, conducting vehicular traffic analysis, and thereafter doing critical analysis of the information gathered. Existing building stock is an important physical, economic, social and cultural capital to any nation (Kohler & Hassler, 2002.). Building obsolescence/redundancy is identified as one of critical issues associated within the existing building stock. To minimise such negative impacts created through building redundancy, strategies such as 'adaptive reuse' (Kincaid, 2000), 'creative reuse'(Latham, 2000)and 'brownfield developments' (Silverthorne, 2006.)have been promoted as better means for reusing the existing buildings. In a way, benefits of reuse are seen as not only a low cost option for the typical end-user, but also in the value of retaining the style and character/heritage of buildings (Ball, 1999). However, this preparation lies in a carefully considered response to the building's structure, elements and components (Latham, 2000). Flexible design relates to a building or a space crafted with a base build that can be repurposed, within reason, to cater for market changes and secure a greater lifespan for the project. When we design, there are multitude of considerations that usually drive the process in its entirely from concept, and one such consideration is a market validation study, which is often key to supplement the projected use of the space.

PROBLEM STATEMENT

Challenges within the built environment are identified in the areas of 'environment considerations' (Kincaid D, 2000); (Geraedts, 2008), 'innovations in technology' (Flanagan & Tate, 1997); (Nutt, 2000), 'planning and policy issues', 'social requirements', 'political forces' (Gann & Barlow, 1996)and 'economic considerations' (Arge, 2005); (Douglas, 2006)

To respond to these macro level challenges, buildings need to be changed in terms of the 'function' they house, the 'capacity' to achieve the performance required for the population they hold and the 'flow' of reacting to internal and external environmental forces (Slaughter, 2000). These challenges occur often unpredictably and without regularity (Latham, 2000).Buildings which are unable to adapt with such challenges will become prematurely obsolete or require substantial refurbishment or demolition, where neither option may create a sustainable built environment. Massive world urbanization is accompanied by an alarming tendency for urban sprawl of city areas. Leading Professionals in architecture, urban planning, economics, sociology, ecology, are worried about it and try to find new, more rational urban planning and space-planning solutions to meet the challenges of modern society. (Tonye, 2018).

JUSTIFICATION OF THE STUDY

The purpose of this paper is to explore the ability of 'Flexible design techniques in the design of a mixed-use building' to respond to future potential built environmental development challenges and changes in sustainable way in Abuja.

OBJECTIVES

The objective of this work is to integrate flexible design techniques with the view to adapt to the current situation in terms of demand between commercial and residential and office spaces in the design of a Mixed-use building as follows:

- To establish the performance of each technique and their impact on buildings and occupants.
- To identify some of the flexible design strategies that can be used to define space based on demand,
- To explore existing buildings with these techniques in place,
- To design a mixed-use building that will adapt to flexible design spaces between commercial and residential spaces within the structure.

LITERATURE REVIEW

From a history of Architecture point of view, the Roman age differed from our present-day conditions in that Romans lacked the differentiation between home and office. Work and leisure were realised in different ways, mainly due to the ancient technology which only changed when energy became available during the 1870s. From that point onwards, electricity was used for lighting, heating, ventilation and cooling, as opposed to the unsustainable approach of Romans who relied on timber for fuel (Bröchner, 2010). According to Tonye

(2018) the sustainable development of a mixed use building are social. Environmental and economic as follows:

A. Social Role: I. Due to the convergence of the city's people to an area, contact

II. increases and consequently creates social link and relationships i.e. social proximity encourages positive interaction and diversity.

III. Security is achieved due to securing the permanent movement in the area.

IV. It enables more and better integrated social housing.

B. Economic Role: I. It encourages a mixed land use thereby creating job opportunities near to homes and reducing the energy wasted in daily moving between home and work.

II. Raising the value of residence.

III. It enhances economic viability of development.

C. Environmental Role: I. It can increase the density of land use in addition to integration since it has mixed uses.

II. Reduction on the dependence on cars, reducing road crowd, traffic congestion and air pollution respectively.

III. It increases energy efficiency.

Otobo & Warebi (2021) stipulated that there are various factors that should be considered in the success of a mixed used development, these principles are combined with an assessment of the economic and amenity synergies between prospective uses. These principles are;

1. Basic planning consideration: Cultural, political and social aspect of the city should be assessed first before locating the project. Sustainability, safety and issues of security should also be looked into and taken into full consideration in order to create an effective mixed-use structure.

2. Integrated theme: The theme of mixed used development should have unified contemporary materials, colors and design details in areas of landscaping, amenities, signage and lightning etc.

3. Aesthetics and architectural development: The design of a mixed use development should complement and enhance the design of neighboring surroundings and houses. There should be architectural continuity.

4. Effective functional design: The design should have efficient functional layout that uses structural systems to reduce cost.

5. Vehicular parking: The parking structure is very important in the design of a mixed used development, there should be good traffics and pedestrian circulation.

6. Safety and security: The highest level of security feature should be seen in every aspect of planning and designs. Examples are increased lightning levels, access control, safe and inviting appearance, maximize visibility and openness, floor to ceiling heights.

7. Building design: The principles of design should be considered and used in the overall design of buildings; this includes scale, balance, rhythm, proportion, visual order etc.

THE STUDY AREA

Abuja is the Federal Capital Territory, in central Nigeria. FCT was formed in 1976 from parts of the states of old Kwara, Niger and Kaduna. Abuja's 2021 population is now estimated at **3,464,123**. Abuja FCT is located in North Central Nigeria. It approximately lies between longitudes 6° 46′ and 7° 37′E and latitudes 8° 21′ and 9° 18′ N. It covers an area of approximately 8000 km² with a mean elevation of 476 m above sea level. The National Bureau of Statistics revealed that for the year 2020 Abuja had 812 registered vehicle. (NGDPR, 2020) (Fig. 1).

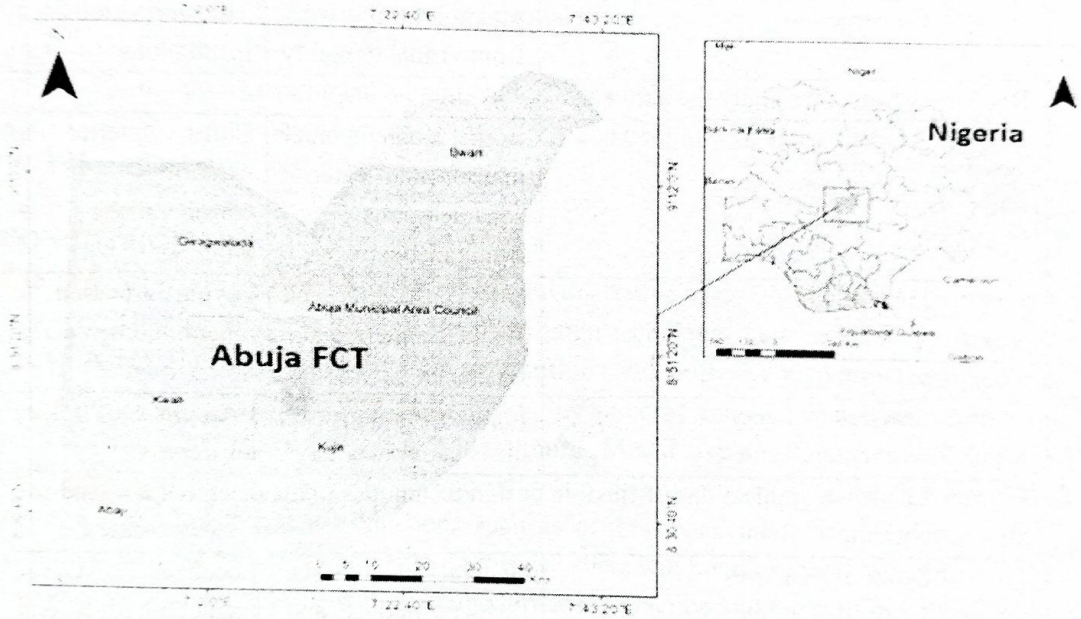


Fig. 1. Location map of the study area and the districts of Abuja FCT.
SOURCE: NGDPR , 2020. Nigerian Gross Open Data for Africa. Bureau of Statistics.

METHODOLOGY

Information for this work shall be obtained by **Primary sources-** interviews and case studies and **Secondary sources-** books, journals, published and unpublished literatures, and also the internet. Also, mixed methods of quantitative and qualitative means will be adopted as follows:

I. QUANTITATIVE

- Questionnaires administration to achieve Objective 2

II. QUALITATIVE

- Carrying out of case studies

- Carrying out of interview

Subsequently, a series of 15 expert interviews were conducted to focus on the study and analyzed based on sorting out by using compare (general views) and contrast (specific views) to the raised questions as tabulated below in (Table 1). Table 1 Qualitative analysis of summarized general views and specific views as follows:

S/NO	Questions	General views	Specific views
1.	Suggest methods used in flexible design techniques in the design of a mixed-use building for achieving the followings:		
	Planning?	Acting globally	Thinking locally
	Design?	Evolution of new concepts	Unity in diversity
	Construction?	Making things work from virtual to reality	Transformation of inspirations
2.	How can we apply the above in :		
	Aesthetics?	Both contemporary interior and exterior considerations simultaneously	Either interior or exterior considerations at atime
	Functions?	Safety, Security and Water, Sanitation and Hygiene	Paying attention to other building details
	Services Delivery?	Implementation of ideas harmonization	Creation of idea awareness
3.	List some applications of flexible design techniques in the design of a mixed-use building		
	Economic Growth?	General Costs, finance, budget and Estimates considerations	Localized Costs, finance, budget and Estimates considerations
	Environmental Protection?	Macro, Messo and Micro climatic situational analysis	Micro climatic Ambience situational analysis
	Social Inclusion?	Separate conditions at a time	Separate conditions at a time
4.	What are the advantages and disadvantages of adopting flexible design techniques in the design of a mixed-use building?		

		Fascinates smart building operations and functionality, but capital intensive	Achievement of sustainable development but not easily obtainable and may be costly

FINDINGS

In 1999, Hill revealed that there are some potential savings to government if flexible housing standards are applied to house construction, especially in Abuja such as the followings:

I. The main economic savings
II. Potential savings in major adaptations costs by providing for such changes in the upfront design of the property.
III. Reduced need to move into residential care
IV. Reduced cost of rehousing
V. Reduced government administration costs
VI. Savings in home care costs for elderly and people with a disability
VII. Savings in health care costs

CONCLUSION

The most important concern of this study is how to achieve a sustainable living environment in a mixed use developments using flexible design techniques help residents of Abuja to establish frequent contact and long term relationships with others. In response, the mixed use development must adapt, offering greater flexibility and efficiency, while helping the citizens to reach for a richer, healthier and better future. Mixed use developments will boast a sustainable community, continuous connectivity and an environmentally friendly atmosphere since it integrates mixed use functions such as offices, residential, retail and supporting facilities. Without proper revitalization of the city, there will be no proper development of the urban space that exists. This will make the city lose attraction and the activity of visitors of long-term impacts.

POLICY RECOMMENDATIONS

The world we live is ever changing and dynamic with the following suggestions.

I. The need for smartly designed buildings and spaces that can perform many functions. Properly planned mixed use developments are recognized as an excellent way to achieve urban revitalization and promote sustainable living environment, as well as creating attractive and vibrant communities by providing several uses within a development.

II. Mixed use developments help residents to establish frequent contact and long-term relationships with others. In response, the mixed-use development must adapt, offering greater flexibility and efficiency, while helping citizens to reach for a richer, better and healthier future.

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