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Attributes and Patterns of Mixed-Use Buildings in Ikeja Model City Planned Corridors Lagos, Nigeria

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Abstract
Several developed countries are comprised of planned cities that support and sustain the needs of their inhabitants. In the 21st century it is almost impossible to find a thriving city without mixed-use developments or buildings. The concept of mixed-use has long been incorporated into our building developmental practices spontaneously. However, planning laws and developmental processes are now emerging to standardize the kinds of mixed-use that are permissible within the built environment. It therefore suggests that mixed-use buildings are indispensable in a metropolitan city due to increasing urbanity. Meanwhile debates abound on what constitute mixed-use as generalization is difficult because localities and socio-cultural dynamics affect the development of mixed-use structures. Mixed-use buildings are notable because they are characterized with combining several functions, and it is also part of the compact city and new urbanism developmental strategy. Mixed-use attributes promote strong relationships and opportunities between residents, and provides varied job while supporting integration. In aligning with other megacities across the world, and to deal with the haphazard development as well as conversion of uses in urban areas prompted the development of Model City Plans (MCPs) for different areas in Lagos State, Nigeria. The goal of this paper is to examine the attributes of mixed-use buildings in Ikeja Model City Plan through focused observation in order to determine the emerging pattern of mixed-use for the area and its implications. After eighteen mixed-use buildings were purposely observed, the study concluded that a well-integrated mix of use is achievable in corridors due to density. But the compliance with the maximum number of floors would take a while due to the level of income of the inhabitants of the area. The study perceived the need for attitudinal change in cultural lifestyle of continual property ownership without means to sustain it, especially in city centers. Similarly, infrastructural developments are also very imperative for the sustainability of mixed-use. Therefore, unless there are special platforms the government could use to ease implementation, the specified maximum heights by the MCP for mixed-use corridors in Ikeja is yet to be achieved due to income level of inhabitants of the area.

Keywords: Attribute, Ikeja, Mix-Use Building, Model City Plan, Patterns

Introduction

According to United Nations Population Fund, it is estimated that by 2030 about 61% of the world total population would live in the cities (UNFPA, 2001). This shows a continual growth in global population of urban residents with a resultant effect on the infrastructures and physical development that will cater for the upsurge. In view of this rise in population of urban residents, the Sustainable Development Goals (SDG) of the United Nations advocates for the creation of sustainable cities and communities (Ban, 2014). In creating these sustainable cities, built environment is a huge consumer of resources such as land and energy; thus an important entity that needs attention.

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Introduction
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Furthermore, mixed-use buildings are significant urban physical developments of the built environment commonly practiced that have thrived into the twentieth century majorly at transit and intersection (Artscape, 2013: Arizona, 2013). It re-emerged in 1960 and 70s as a tool for urban revitalization (Rowley, 1996). Mixed-use buildings are notable because they accommodate multiple functions. The most referenced classification of what constitute mixed-use according to Gentin (2009) and Wardner (2014) was championed by Urban Land Institute (ULI) that described mixed-use as a structure where uses are integrated and pedestrian oriented. Besides, according to Metropolitan Area Planning Council, Boston mixed-use building that conforms to the minimum development standard promotes strong relationships between residents, contributes access to health living, varied job opportunities and regional interaction which sustains the society (MAPC, 2010). Hence in investigating the attributes of mixed-use building, it is important to also analyze its progress toward sustainability usually credited to mixed-use.

However, the development of mixed-use and high density houses in a lot of urban centres is confronted with challenges due to zoning laws (Kellett & Tipple, 2000). Land use zoning is basically used to control physical developments. Prior to the modern zoning law and land-use policies, the most prevalent method of zoning was Euclidean (Arizona, 2013). This practice clearly has consequences and effect on the development of mixed-use buildings (Herndon, 2011). Because it zones land use into residential, industrial and commercial with each use having its own sub-categorization. Meanwhile, Foster (2003) and Herndon (2011) asserts that the ensuing effect of such zoning is urban sprawl, increase in commuting time, pollution and traffic congestion. This therefore suggests the need for flexibility in zoning laws where people's participation is highly essential (Otubu, 2012). Although zoning is practiced generally in Nigeria in accordance with the National Building Code (NBC, 2006)., however in Lagos State land use policies accommodate mixed-land use practices as well.

Lagos State is the fastest growing urban city in Nigeria with persistent rapid growth in population (Adeleke *et al*, 2016). As a result of this there are continual demands for basic infrastructure which necessitate the development of Model City Plans (MCPs) by the Ministry of Physical Planning and Urban Development. These plans are aimed towards creating a livable, greenery and sustainable city. The plan stipulates ordering of land-use, smart development, compact city through high density development and mixed use building in order to create functional environment that reduces urban problems (Isidore & Adedapo, 2014). The plan for redevelopment of Lagos State has five MCPs and three master plans. The MCPs include Ikoyi-Victoria Island Model City Plan, Ikeja Model city plan, Apapa Model city plan, Lagos Island Model City Plan, Mainland Central Model city plan and Alimosho model city plan. While the three master plans are; Badagry master plan, Lekki Penisula master plan and Ikorodu master plan (Mainland Model City Plan, 2011-2033). Moreover, the Lagos State Development Plan (2015-2025) which specifies the provision of infrastructure and basic services at every 15 minutes walking distance (1000 meters) in settlement habited by low income earners, indicates embracement of mixed-use development (Adeleke *et al*, 2016). In line with this, Coupland (1997) opined that mixed-use is an approach towards providing functional urban spaces at different levels of development, and this has been part of developmental pattern overtime (Herndon, 2011).

The MCPs in Lagos administrative precincts include the Ikeja Model City Plans. Ikeja was the political capital of Nigeria before the relocation of the capital to Abuja in 1986 due to reasons among which is traffic congestion in Lagos State (Filan, 2012). Amazingly, Lagos State

which is the most populous state in Nigeria has the smallest land area of about 385.9m^2. Consequently, the Model City Plan for Lagos tends towards verticality in terms of building development and higher density (Mainland Model City Plan, 2011-2033. The Ikeja Model City Plan proposed corridors for mixed-use building and High Street due to haphazard development and illegal conversion of building uses. These corridors are meant to legally control the haphazardness in building development with specification which varies in terms of maximum building height, percentage of mix, building density and setback. Thus, this study seeks to investigate the attribute and pattern of mixed-use building in Ikeja as well as their implication on the corridors. This is necessary in order to ascertain the attributes peculiar to Ikeja in order to facilitate the necessary development for sustainable mixed-use building in Lagos, Nigeria.

The Renaissance of Mixed-use development

Scholars have often referred to Jacob (1996) when discussing the renaissance of mixed-use development (Grant, 2002, Hoppenbrouwer & Louw, 2005; Rabianski *et al*., 2009; Rowley, 1996). The study opined that mixed-use is formed by a fine-grained mix of uses; preferably two uses and should be pedestrian oriented. Brundtland's report according to Walker, (1997) reawakened the concept of mixed-use development because its principles are in line with the new urbanism, Smart Growth and the compact city concept, and are all aimed towards improving the built environment (Herndon, 2011). Universally there is a lack of generally accepted delineation of what constitutes mixed-use development (Coupland, 1997; Grant, 2002; Hoppenbrouwer, 2005; Rabianski *et al*., 2007). In line with this Rowley (1996) asserts that mixed-use development cannot be detached from cultural priorities and lifestyle. Similarly, Dave (2010) re-established Rapoport (1997) idea that location and socio-cultural factors in developing countries are factors that inhibit the generalization of attributes of mixed-housing, which are sometimes referred to as mixed development or neighbourhood. However, Angotti and Hanhardt (2001) opined that over time development of a community has never exclusively been single use or mixed-use. It thus suggests that mixed-use building attributes might vary depending on location and inhabitants' socio-cultural needs.

Classification and Conceptualization of mixed-use Developments

There are various classifications of what constitute mixed-use. For instance, Urban Land Institute (ULI) describes development as mixed-use when mutually supporting functions co-exist (Joost, 2008; Herndon, 2011). Another classification was done in 2006 by cross-sections of associations' bodies, in a study to identify the major feature of mixed-use development (Niemira, 2007). In sum, the two studies describe mixed-use as a well-planned structure that maximize available land with functions or uses that could be well incorporated with one another, and each use should be adequate and enough to attract demand (Niemira, 2007). Despite these, there are deliberations as to what constitute mixed-use development, so also its conceptualization but the most cited concepts are (Rowley, 1996), and (Hoppenbrouwer & Louw, 2005). Therefore the variables used in this study were adapted from these two concepts. Although the variables specifically address mixed-use development or mixed-use buildings at neighbourhood level, it was adapted to look at mixed-use at building level because MCPs in Lagos were based on regeneration of an urban area, where focus was on mixed-use building in specified corridors. The parameters that were operationalized to examine Ikeja mixed-use corridors are grouped into tripartite factors. Firstly are the physical attributes that include building dimension, number of floors for vertical development, accessibility and building location. Secondly are the functional patterns with variables that include nature of combined functions, number of functions combined in a building, arrangement of activities,

building texture /intensity of mix i.e. grain and density. Thirdly are the property market (demand), and public policy and regulation. These factors are necessary because they are essential to the success of any given mixed-use building.

The Ikeja Model City Plan

The emergence of Model city plans (MCPs) in Lagos was largely informed by the disorderliness in development and lack of infrastructure to cope with the ever increasing population in Lagos. The Ikeja model city plan identified corridors for mixed-use buildings; these corridors are largely along major transport routes. The MCPs specified maximum height for the corridors. Ikorodu road, Anthony-Oshodi express way, Lagos-Ibadan Express way, Mobolaji Bank Anthony Way, Obafemi Awolowo Way and Kodesoh/Oba-Akran Way are mixed-use corridors of maximum height of fifteen floors; Lateef Jakande-Ogba-Isheri Road, Kudirat Abiola Way (Oregun road), Allen-Avenue/Opebi Road, Opebi link, LASUTH to Oba Ogunjobi leading to fomer Kingsway stores, Adekunle Fajuyi, Joel Ogunnaike and Isaac John are mixed-use corridor of maximum height of ten floors; while ACME Road, WEMPCO and Billings Way, Toyin Street, Ikosi road, Mobolaji Johnson Avenue, Oregun link bridge/Osho and Olowu Street are mixed-use corridors of maximum height of six floors (Mainland Model City Plan, 2011-2033). Ikeja is significant because despite the movement of Nigeria's Federal Capital, it is still thriving in commercial and industrial activities scattered all over the area. Ikeja still accommodates the seat of government in Lagos State therefore Ikeja is indispensable when it comes to the development process in Lagos State.

Methodology

This study utilized case study strategies (Yin, 2003) as it considers and focuses on mixed use pattern and attributes as both a phenomenon and relevant contemporary issue due to its benefit of aiding the understanding of ideas clearly (Stake,2010). Thus the study area comprises of mixed-use corridors within Ikeja Model City Plan (MCPs) with limitation to corridors located within Ikeja. The study espoused exploratory approach and is part of an ongoing research on sustainability in mixed-use building development in Lagos, Nigeria. Although, there are emphases on the development of mixed-use corridors in Lagos State, it was visibly not yet part of the mainstream development strategy which makes sample frame difficult to attain. However, utilizing the case study research approach the study extended consultation to stakeholders involved in urban development process in Lagos State in addition to the review of MCPs and follow up leads from experts. Meanwhile, the variables adopted in examining the phenomenon were investigated using an observation checklist developed from the concepts of (Rowley, 1996), and (Hoppenbrouwer & Louw, 2005). Subsequently, eighteen (18) buildings that met the criteria of multiple functions, vertical development and situated along the mixed-use corridors were purposively selected and considered fit to provide the required data. These buildings are chosen as a representative sample of identified mixed-use buildings in order to target illustrative tendencies of the mix-use patterns and attributes rather than generalize the outcome. The selections were made from the following mixed-use corridors; Mobolaji Bank Anthony, Kodesho / Oba- Akran, Ikorodu road, Obafemi Awolowo way, and Allen-Avenue / Opebi road. Further still the selection was done one after the other until saturation was attained. Thereafter the data obtained were analyzed using descriptive method by means of content analysis. Results are presented in figures as implicit findings were deduced to project explicit mix-use pattern in the study area guided by the ideals of Miles *et al.*, (2014) for generating meaning and confirming findings. Intuitively, recurring mixed-use patterns and themes (attributes) emerged from the data through the consideration of options enshrined in the factors as frequent phenomena.

Results and Discussion

The Ikeja area of Lagos State is a developed urban setting with residents comprising of moderately high and medium income earners. Nevertheless, the study discovered relatively high density in the area and continual increase in population growth. After subjecting the data derived from the evaluation of the eleven (11) variables to descriptive statistics, the study recorded the following significant outcomes.

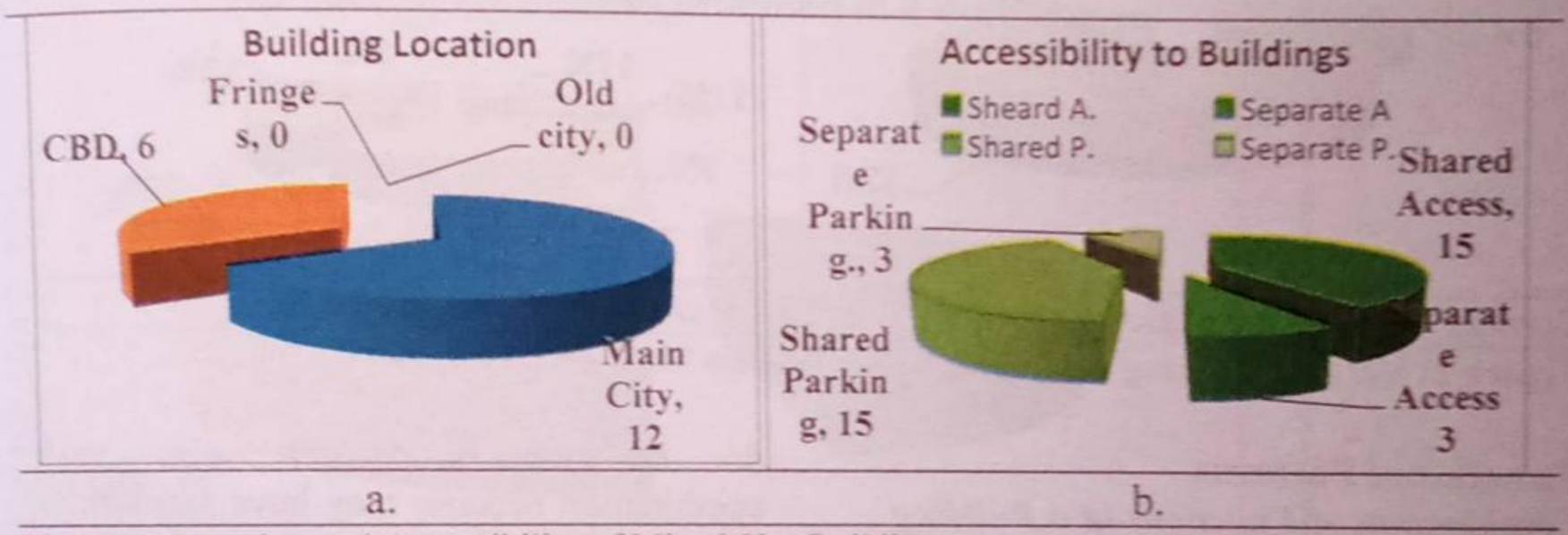
Physical Attributes Component

Building Location

The location of mixed- use buildings observed were a functions of specifications in Ikeja Model City Plan. Meanwhile, four major urban neighborhood distributions that include Central Business District (CBD), Main city, Old city and Fringes were identified. Figure 1a present the summary of mixed-use building in these quadrille locations. Twelve (12) of the buildings observed were located in the main city area while six (6) were in the Central Business District (CBD). These two areas are located within the urban center which is the nucleus of the city, thus supporting continual change in terms of demand. Therefore, this result indicates the reason as to why corridors designated for mixed-use building in Ikeja are neither in the fringes nor in the old city.

Accessibility to buildings

Access road to majority of the buildings studied are shared by different functions as summed up in Figure 1b, this perhaps is because the idea of mixed-use building are usually not conceived from the initial design stage. Meanwhile mixed-use building with shared premises has separate access roads which tend to also reflect on the provision of parking spaces. Yet there are no distinguishing parking spaces for the various functions, as only functions with separate access have separate parking spaces. The implication is manifests when the issue of shared parking spaces found not to resonate well with the users.



a. b.

Figure 1: Location and Accessibility of Mixed-Use Buildings

Building Dimension

All the mixed-use buildings studied are vertical in dimension as illustrated in Figure 2a and was found to be common across the neighborhoods. Lagos State is a state of aquatic splendor with limited land area compared to other states. The scarcity of land in Ikeja for instance is responsible for vertical building design practiced by developers. Although among the mixed-use buildings studied, there are four that are in shared premises, the building dimension in such cases is a combination of shared premises with verticality. Thus, the urban nature of Ikeja suggests that the horizontal dimension of mixed-use building development is inappropriate for the area as indicated by the outcome of observed buildings that is recorded in Figure 2b.

Number of floors for vertical development

The Ikeja MCP specified fifteen (15), ten (10) and six (6) floors for maximum height of mixed-use building. In Figure 2c, the

result shows that four floors were common while just three out of the eighteen buildings studied had more than five floors. This is due to the fact that mixed-use building is not yet well accommodated into the mainstream of building development in the area. Additionally, the larger percentage of the residents belong to the low and middle income earners' group that could not afford the cost of higher numbers of floors as specified by the MCP. Thus, this has an impact on the nature of mixed-use building within the corridors and the demand for the scarce spaces due to limited number of floors which is definitely resulting into high rental charges. Hence, it implies that there is a need for increase in the number of vertical floors as rightly proposed by the MCP.

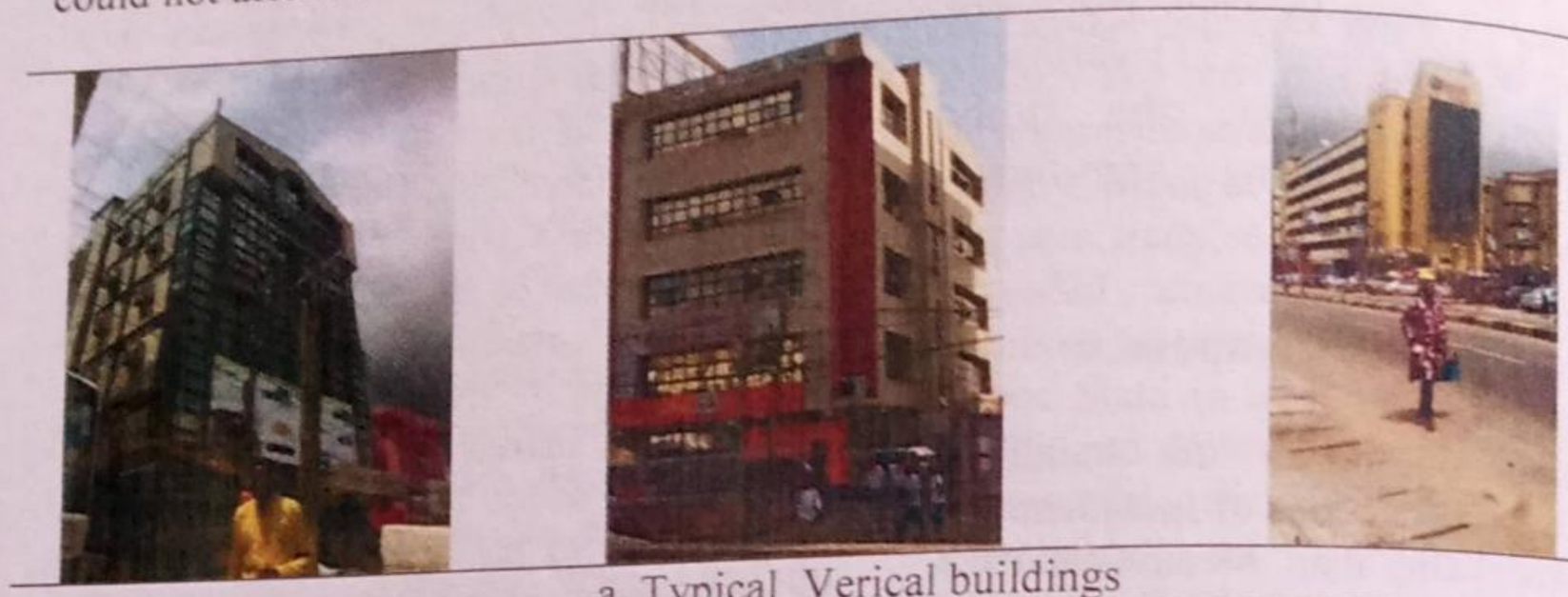


Figure 2: Vertical building development along Ikeja MCP corridors.

Functional Patterns

Combination of Functions in a Building

The breakdown presented in Figure 3a shows the types of functions commonly combined in mixed-use buildings. In all the nine different categories of functions identified were observed to have been combined. And all the categories do not have more than four types of functions housed in a building. This shows that the users and residents of Ikeja could cope with three to four functions combined in a building. Administrative and Commercial category (combination) is more prominent along the corridors, an indication that users do not have problem with such combination because they have similarities in terms of their day to day operational process. Residential, Administrative and Commercial category (combination) is also conspicuous in all the corridors studied with Administrative and Commercial mix-use having their peak period of services during the day while the residential part keeps the building functioning in the night when residents have retired after the day's activities. This has great impact on the corridor giving the buildings 24 hours operation duration. Therefore, in corridors for mixed-use building in Ikeja and Oshodi

MCP, Administrative/Commercial and Residential/Commercial/Administrative functions are combinations that require consideration at the design stage.

Number of functions combined in a building

All the building observed had one or more functions combined which is an attribute of mixed-use development. It was observed that buildings with two functions combined are most recurring as reported in Figure 3b. This could possibly be linked to the upgraded building laws in the corridor where building in those areas are recommended for higher numbers of floors and mix of use by the provision of the MCPs. However, five functions were observed as the highest number combined in a building. Although such category is very minimal, it indicates the possibilities of having such combination in a well-planned mix-use building.

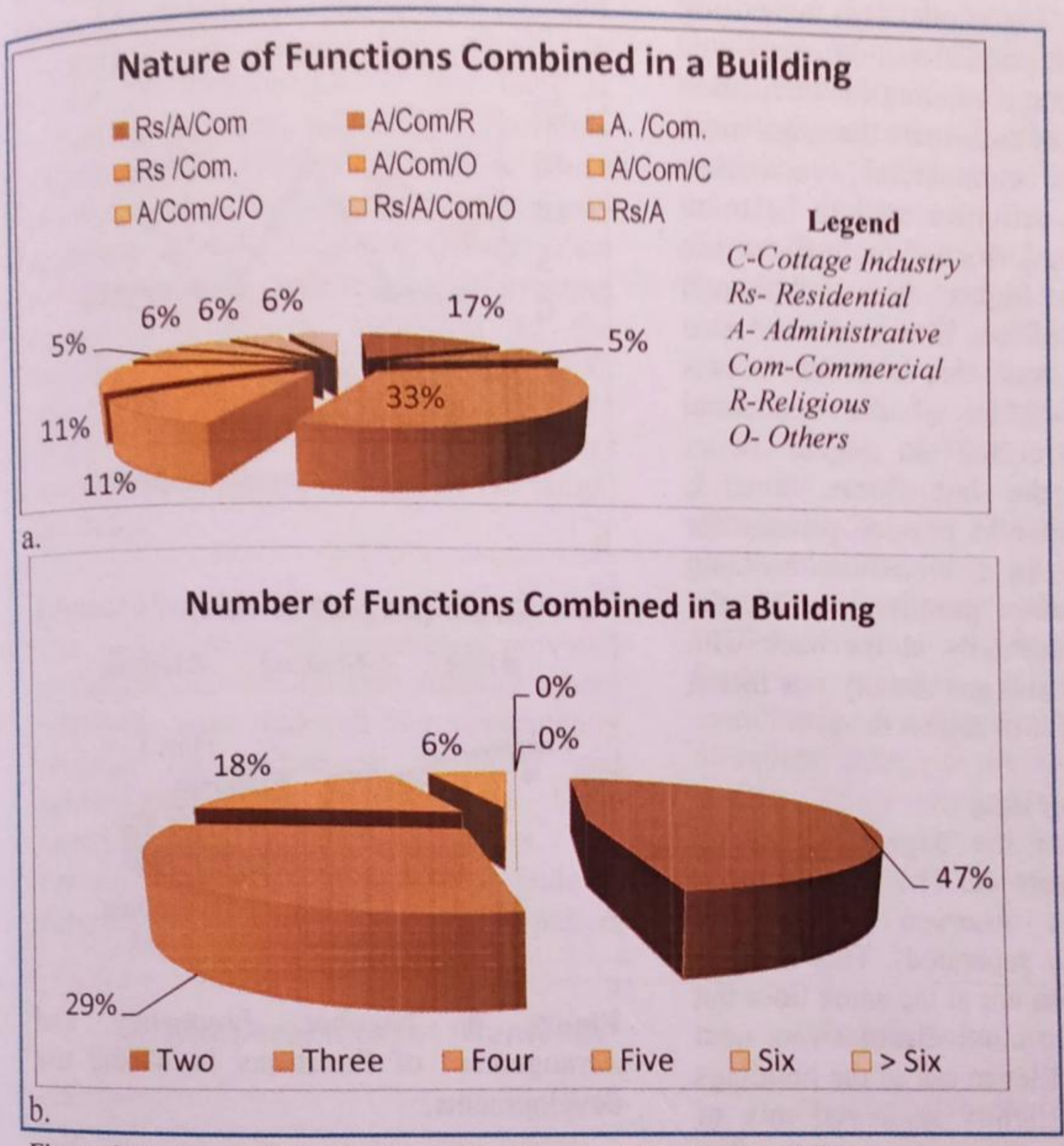


Figure 3: Nature and distribution of functions in Mixed-use buildings.

Density of functions nature

Density here implies the frequency of occurrence of functions located within a mixed-use building. It signifies the amount of space or number of units of a function contained within a building and is a measure of the intensity of functions occurrence as shown in Figure 4a. The purpose of this is to establish functions that are more prominent and possibly patronized based on high, medium and low categories. Majority of the buildings observed recorded the administrative function towards a high density pattern; this suggests that it is the most frequently needed by the inhabitants. However the aggregate numbers of medium and low density for commercial use are more than

that of administrative uses. This implies that some factors are inhibiting frequency of commercial uses. These factors might include level of income of the resident and high rental rate among others. Therefore, administrative and commercial uses are suggested functions that should be most considered for developments in the area.

Arrangement of functions

By arrangement commercial activities are usually located on the ground floors and in some cases first and second floors as summarized in Figure 4b. This is because ground floors in particular and lower floors in general are more suitable for circulation and movement of customers therefore more peculiar to commercial activities. Administrative activities tend to be more formal, thus majority of the offices are located at the higher floors. Although administrative offices like banks are also on the ground floor, this is to ease access for customers. Most of the residential functions are located on higher floors especially on the last floors. This is important in order to provide privacy for the inhabitants. In a mixed-use building that has shared premises residential activities are ordinarily at the back with separate access and are usually not facing the major corridor or access road.

Grain (Degree of mix)

The outcome of the degree of mix is presented in Figure 4c. The most common degrees of mix observed are basically medium (slightly separated). This is when different functions are at the same floor but not necessarily at close distance (not next to one another). Eleven out of the buildings observed have slightly separated mix of functions. While functions that are fine (close) were found in three out of all the buildings observed. This category consists of functions within a floor (next to one another). Further still four (4) of the buildings are coarse (more slightly separated) with functions separated by floors. This is perhaps due to different categories of inhabitant influencing the demand for a type of use, thus having less concern about the degree of mix of functions.

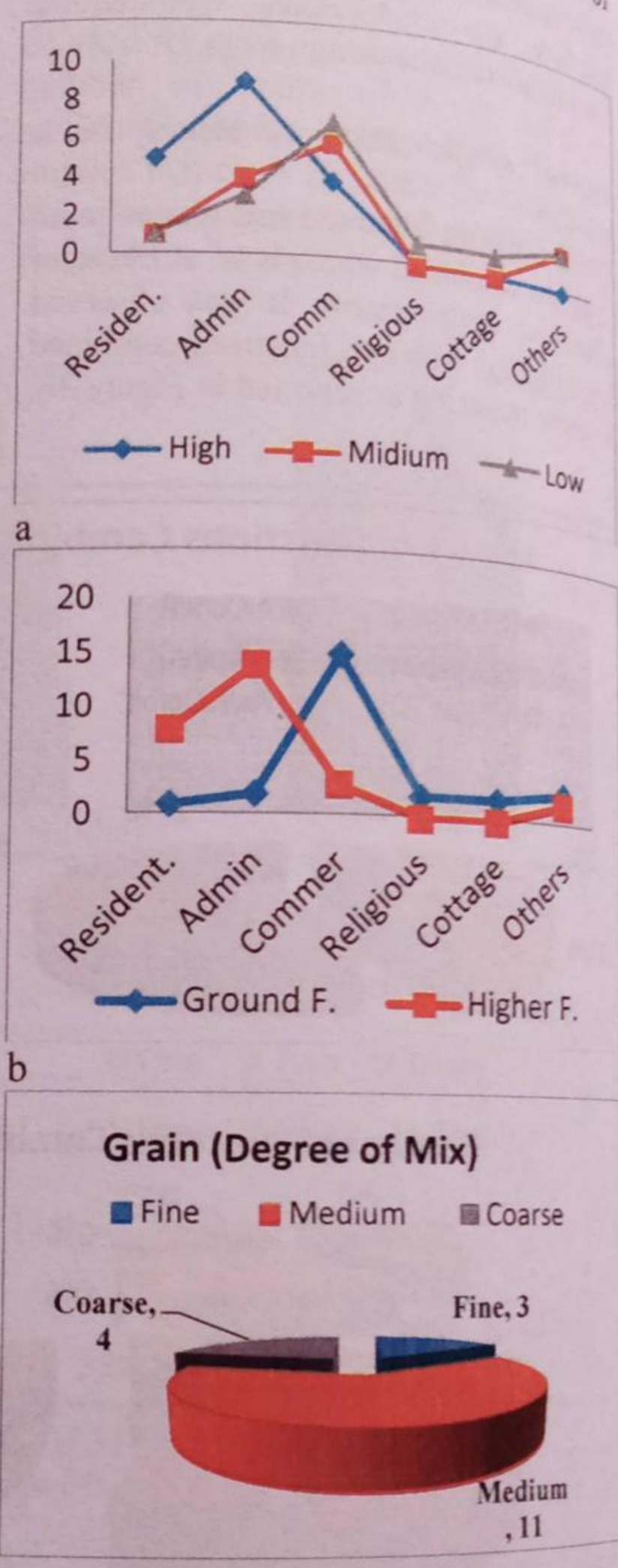


Figure 4: Number, Frequency and Arrangement of Functions in Mixed use developments.

Policy and Market Demand

Property Market Demand

In terms of demand for mixed-use buildings, Figure 5a indicates a high demand for administrative purposes. This is due to the concentration of the buildings within the main city and central business districts (CBD). Although same demand would have been thought about commercial uses, but it is otherwise due to the cost of

rent which is high for the low and middle income earners that reside in the area. The idea of mixed-use is to bring work-live environment, where there is 24 hours use of the building. Residential use recorded low ranking in Ikeja corridors while there is also an absence of commercial functions like club house that could keep the building alive even at night hours.

Public Policy and Regulations

Public policy and regulation on mixed-use building, according to the MCP suggest areas for mixed-use corridors along with building height, density and setback. In Figure 5b, it is noticeable that there is mixed-use building outside the corridors dedicated to it. Although, all the buildings observed are in line with previously approved setback. This will change when the owner and developer start erecting mixed-use buildings according to the maximum height specified by the MCP, which varied from 6 floors, 10 floors to 15 floors depending on corridor. Density would also definitely change as the height increases.

Identifying Attributes and Patterns.

The evaluation of the parameters provided an insight into the inherent findings where inferences were deduced that subsequently revealed the mixed-use attributes and patterns practiced along Ikeja MCP corridors. The outcome shows that verticality of mixed-use building dimension is a foremost practiced pattern in Ikeja with isolated cases of shared premises. This phenomenon is common in cities particularly where land constrain is common as the case of Lagos state, Nigeria. In Ikeja Mixed-use buildings are commonly located in the main city and the central business districts (CBD). The most popular combinations found are Administrative and Commercial functions while a combination of Administrative, Commercial and Residential functions are likely patterns that may be valued in these corridors as there exist mixed-use buildings with such combinations. Meanwhile, the functions that are distributed horizontally and vertically across the mixed-use buildings are usually closely related with compatibility of functions as a determinant of the degree of mix. Most often Commercial functions are at the lower floors while Administrative and Residential functions are sited on higher floors. In shared premises provision for access and parking are usually separated. The ordering of the density of functions that coincides with the demand is usually patterned-Administrative, Commercial, and Residential in ranking. Existing regulations advocates compliance and conformity with MCPs' building height, density and set back as long term plan towards ensuring sustainable development which requires attitudinal change in property ownership. A matrix of evolutional emergence of attribute and patterns is presented in Table 1 and illustrated in Figure 6.

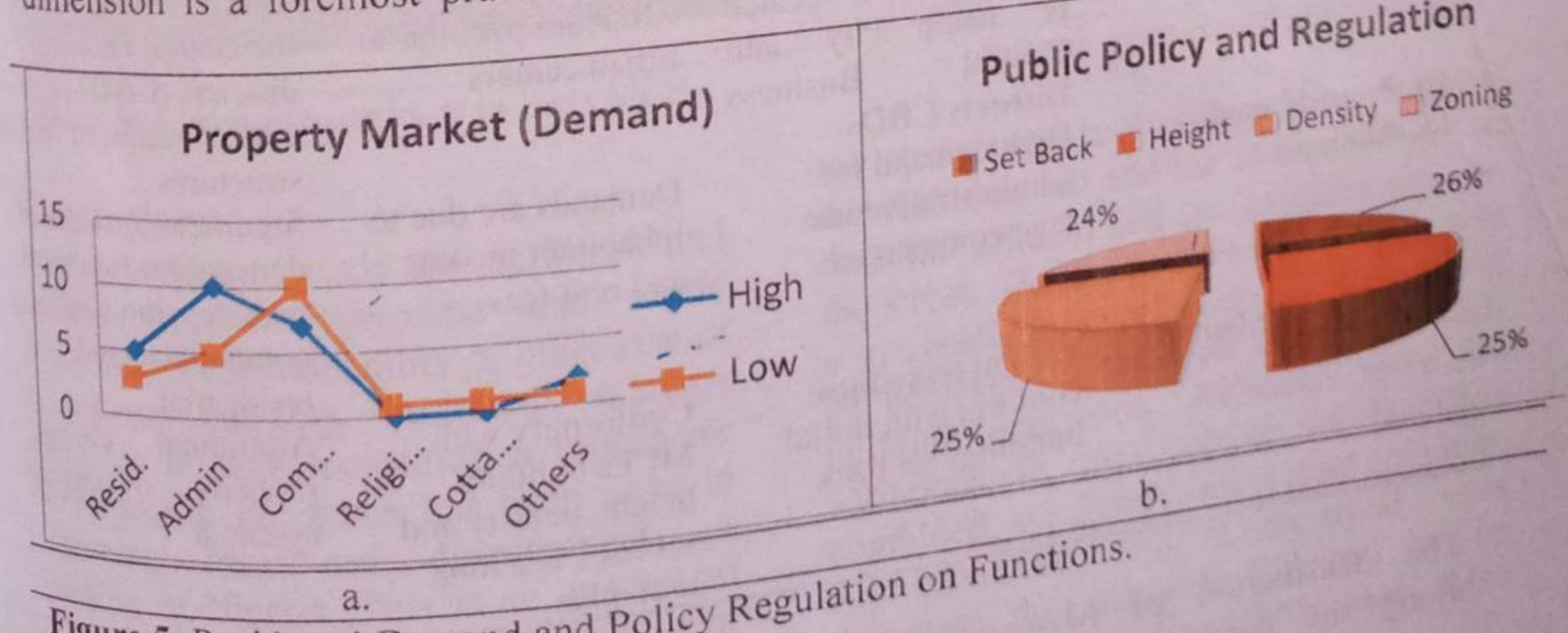


Figure 5: Residents' Demand and Policy Regulation on Functions.

Table 1: Explicit and Implicit outcome- Derivation of Attributes and Patterns

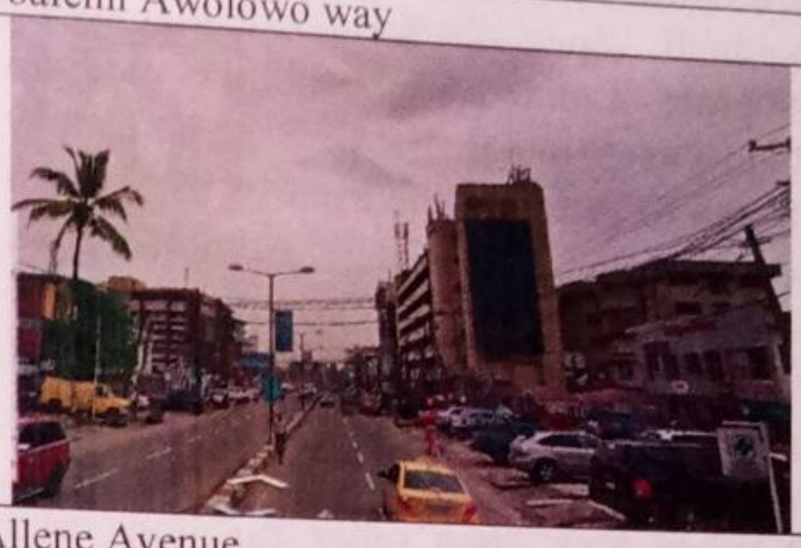
Parameters	Explicit Findings	Implicit Inferences	Emerging Pattern Attribute/
1. Building dimensions	Relatively high density and scarcity of land.	Verticality & shared development is practiced.	Verticality (shared premises)
2. Numbers of Floors	Four floors predominant	MCPs specification is a long time plan /strategy	Verticality inevitable
3. Functions combined	Administrative & commercial most commonly combined functions	Ability to produce 24hours usage of mixed-use buildings	Administrative & commercial. Administrative, Commercial & Residential are possible patterns
4. Number of function combined	2 to 3 numbers of functions is common	Possibility of more than 3 functions in a building	Several closely related functions should be combined.
5. Functions arrangement	Functions are mixed within floors but some functions are more common to certain floors	Function that require influx of different kind of people are located on lower floors	Commercial functions in the lower floors, while administrative and residential in higher floors
6. Accessibility and parking	Access and parking are usually shared	Need for separate access and parking especially for residential use	Shared premises provides necessary separation of access and parking
7. Grain (Degree of mix)	Slightly separated with different functions within a floor	Users' needs and compatibility influences demand for use	Compatibility should determine the degree of mix
8. Density of functions	Administrative is high, Commercial is medium and Residential is low density	Intensity of function depends on resident income and needs	Order of density of functions: Administrative, commercial, and residential
9. Location	Basically mixed-use buildings are located in main city and Central Business Districts CBDs.	Mixed-use in Ikeja MCP are peculiar to urban centers	Main (New) city area and the central business districts (CBD) have concentration of Mix-use structures.
10. Property market (demand)	High demand for administrative use than commercial	Demands are due to inhabitant income and rent fees	Significantly order of demand for functions include; administrative, commercial, and residential
11. Public regulations	Present mixed-use conform with initial buildings set back	Conformity with MCPs building height, density and set back is a long term plan	Attitudinal change in property ownership is essential

The distribution of Misused buildings along the corridors in Ikeja MCP as illustrated in Figure 6 confirms the results recorded from the observation.

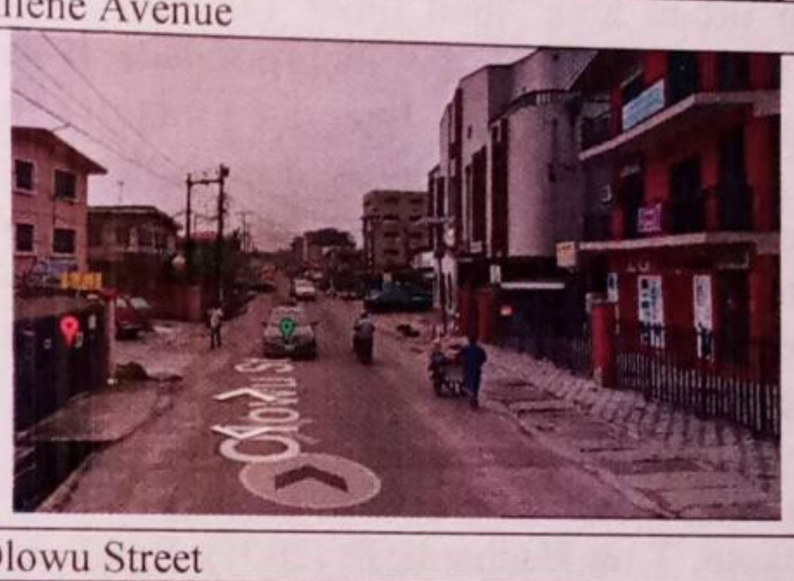

Kodesoh Street

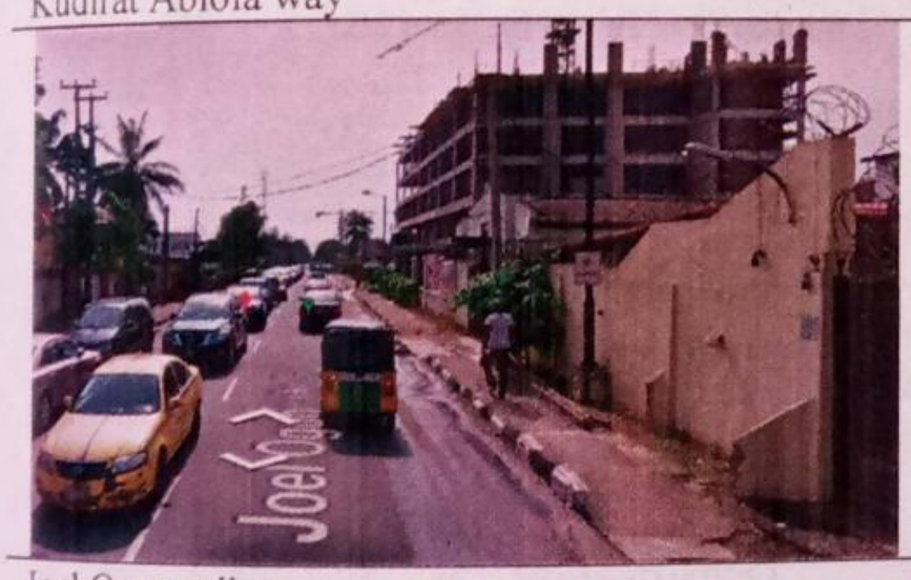

Obafemi Awolowo way


Oba-Akran way


Allene Avenue


Kudirat Abiola way


Olowu Street


Joel Ogunnaike

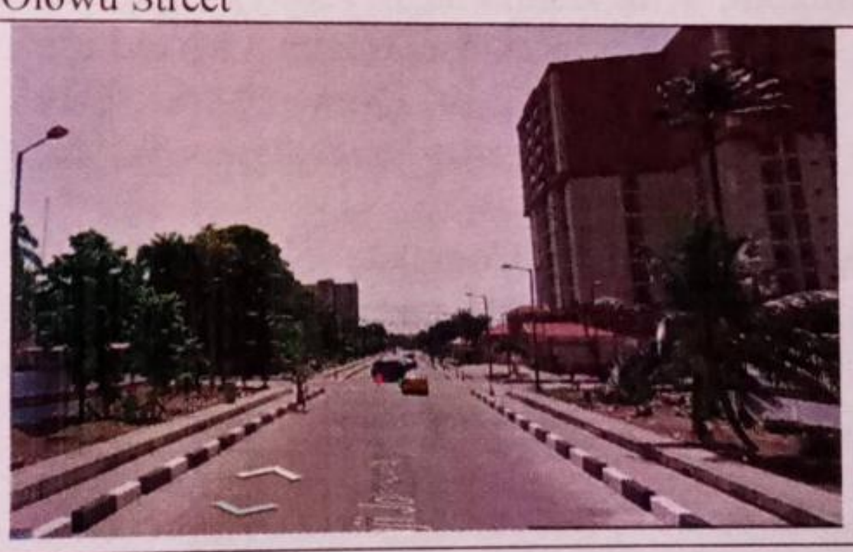

Olowu Street

Figure 6: Mixed-use corridors in Ikeja MCP. Source: www.instantstreetview.com

Conclusions

It is important to study the attributes and pattern that are germane and could determine the sustainability or otherwise of mixed-use building. Although scholars differ as to what constitute a mixed-use development, not much has been done in analyzing mixed-use development or building in Nigeria. This is an attempt to address the practicality in the application of the provisions made by MCPs in Lagos, Nigeria particularly the Ikeja MCP. Also, the study tried to ascertain how receptive the residents are and the overall benefit to both the affluent and the common man on the street. The study thereafter reveals that a successful integration of mixed-use could be achieved in the area through vertical building dimension. Although there are variations in the number of functions combined, apparently two is most common. Administrative and Commercial uses dominate the demand, followed by its combination with Residential uses. Also

for mixed-use in the area to be successful, the general pattern desirable is mixed-use with commercial and retail on lower floor and residential on higher floors. Nonetheless the sharing of access road in majority of the corridors as practised now is not sustainable. To achieve sustainable development access routes should be separated, especially for residential users. The grain of mixed-use building is medium (slightly separated) because it is clearly difficult to presume the kind of use within and between floors. Administrative function, followed by commercial and residential perhaps should be the order of function provision due to demand and the fact that all the corridors are located within the urban area, then other functions like eatery could also be incorporated, It is concluded that a well-Integrated mix of use is achievable in corridors due to density, but the compliance with the maximum number of floors would take a while due to the level of income of the inhabitants of the area.

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ASSESSMENT OF PRECEDENT ANALYSIS PROCESS IN ARCHITECTURAL DESIGN PEDAGOGY IN NIGERIAN UNIVERSITIES

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In architectural design pedagogy, precedent studies (also commonly referred to as case studies) are employed as educational tools to deliver information on the completed building, the design process or challenges faced by the architect and the solutions proffered. However, the manner of reporting on cases studies has been criticised as being oftentimes anecdotal and offering an incomplete picture, lacking an appropriate precedent assessment format. In this regard, this study seeks to explore if precedent analysis is engrained in the method used to analyze existing buildings by students of architecture in Nigerian universities. The students' format of analyzing existing buildings is studied and compared to Alexander Tzonis widely employed' framework for precedent analysis. Consequently, a case study using mixed research method was adopted. In the process, data was collected via questionnaire survey and document study of archived students' theses. The results show that the students' approach to precedent analysis is partially thorough and falls short of the acceptable standards. In addition, the outcome indicates that students receive minimal guidance from design mentors which contributes to under-studying existing buildings. Consequently, students face challenges that include the lack of access to the buildings' drawings particularly construction floor plans and sections that leads to incomprehensive assessment. Afterwards, the study established that students of architecture in Nigerian universities require more tangible guidance for proper precedents' analysis. Also, there is the need to facilitate access to building drawings or access into the buildings. Professional bodies and regulatory agencies such as Nigerian Institute of Architects and Architects' Registration Council of Nigeria should assist in enabling online documentation of certain buildings' drawings for study purposes. The findings suggest the need for operational guidelines in conducting precedent studies by students in Nigerian universities.

Keywords: architectural design, pedagogy, case studies, Nigerian universities, precedent analysis

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INTRODUCTION

Architectural training has consistently prioritized the use of precedents in the design process —from Antiquity through the Middle Ages to the Renaissance as well as in the French Ecole des beaux arts. Even today, precedent studies (or case studies as they are commonly referred to) continue to be employed as a component of the design process for students (Kuhn, 2001) as it allows them to appreciate and gain post occupation experience of users' interaction with buildings, thereby ensuring that mistakes are avoided in the students' own designs as well as serve as a reference for new design solutions and development. Precedents usage in design also ensures that designers are informed of users' desires thereby promoting sustainable design based on the reconciliation of conflicting values and concepts. This is most important when new approaches are desired to deal with reoccurring planning and design problems. Precedent based learning ensures the reduction of design errors enabling imaginative and advance design relying on evidence based design solution. Consequently, students are taught how to design by studying and explicitly analysing previous works of architecture (Guney 2011). According to (Omer, Cumming, Shealey and Tuncer, 1996) it is imperative for students to be exposed to a rich repertoire of outside buildings.

The manner in which students conduct studies into the built environment, has been criticised by several authors including Stevenson, (2014); Salama, (2006); Christenson and Bakr (2007); Restrepo and Christians (2005) as well as Boling, Gray and Smith (2015). Case studies of existing buildings that should provide students with practical appreciation of design problems, phenomenon and solutions in order to support their studio design proposals are often given less priority. Instead more attention is given more to the product of design by both students and mentors, than is paid to the process by which the finished product was achieved. Hypothetically, the process of conducting these precedent studies by students requires investigation as they usually form part of the studio requirements of the design process. Meanwhile, studio based learning is an integral part of design education and it is characterized by a pedagogical model that includes practical learning and critical thinking using reasoning methods- an analogical and metaphorical reasoning towards design solving problem (Choi and Kim 2016).

Studio based pedagogy inculcates the principles of experiential learning, a hands on, learning by doing approach which focuses on the students' active involvement in their learning process. Facdev@niu.edu (2016) defines experiential learning as "a philosophy and methodology in which educators purposefully engage with students in direct experience and focused reflection in order to increase knowledge, develop skills, and clarify values". Experiential learning is also referred to as learning through action, learning by doing, learning through experience, and learning through discovery and exploration. In Experiential learning students partake in real life activities which they reflect on activities, and incorporate their new understanding of

those activities into their lives (Bohn & Schmidt, 2008.) The theory, despite its limitations, is recognized as a useful framework for teaching and learning design (Tezel and Casakin 2010; Prakash, 2015).

Although learning content is important, learning from the process is at the heart of experiential learning. During each step of the experience, students will engage with the content, the instructor, each other as well as self–reflect and apply what they have learned in another situation.

In architectural design pedagogy, experiential learning takes place via the vehicle of studio based learning; problem based learning as well as precedent based learning. Students are expected to study and analyse existing buildings as part of their design process. However, in order for the precedent to be useful, the knowledge embodied in it needs to be made explicit and this calls for precedent analysis. (Guney,2011)

Experiential learning is a minimal guided approach to pedagogy. It has been argued though, that minimal guidance does not work and students need to be properly guided by mentors. (Kirschner, Sweller &. Clark 2006).

Background studies

Precedent Studies as part of the Design Process

Precedents could be regarded as previous works and assertions that could serve as an illustration or regulation towards a subsequent act of similar analogy. Still, a precedent could be in the form of a person or thing that serves as a model. DeFazio (2008), referred to precedents as phenomena which exist in cognitive or physical form that provides information on existing design which gives insight towards solutions to the next iteration of a new design. He further outlined syllabi, lecture materials, visual and auditory materials, lab and homework assignments, projects, papers, performance results, episodic memory, and similar artifacts of previous works as samples of precedents. A precedent serves as a source of inspiration and an Idea or guide to a method while designing. Fang (1993) described a precedent as a pre-existing building or other built environment that could serve as an example or a constraint for the current work. Additionally, precedents refer to the representation of knowledge about a past design in a form that makes it applicable or reusable in a new but similar problem situation (Akin, 2008). It is therefore evident that using works of precedents provides solutions to similar problems thereby serving as a reference point when new design products are to be generated or developed. Gabi Goldschmidt has suggested that the phenomenon should be referred to as reference rather than precedent (Goldschmidt, 1998).

Historically, the use of precedents in architectural education dates back to the French Ecole des Beaux Arts (Taneri, 2008). In Architecture to be specific, precedents are widely employed by both students and professionals when new designs are being conceived (Kuhn,(2000); Zarzar,(2003); Difazio,(2008); Van den Toorn and Guney,(2011); Boling, Gray and Smith (2015); Akin,(2008).Hence, precedents are sources of knowledge for designers and are important in generating images of likely solution space in order to attain impressions related to modes, styles, trends, uses of

materials and fabrication techniques, better still they are potential sources of inspiration (Restrepo and Christiaans, 2005). Precedents are applied in a number of different ways in architectural design pedagogy. They could be used to illustrate the results of using certain materials or manufacturing processes. Also, in comparing differences in styles or design movements or in discussing the effects of changing the spatial relations among components in order to monitor trends, or as sources of knowledge and inspiration. Nevertheless, this study focuses on the evaluation of built forms as precedents by students of architecture in Nigerian universities.

Value of Precedent Learning in Architecture

As mentioned earlier, the term 'precedent study' is often used synonymously with 'case study' (Sarvimaeki, 2013). Although there are controversies associated with the employment of case studies as a research method (Zainal, 2007; Sarvimaeki,2013), this has not dampened their effective usage in many disciplines, such as law, business, medicine, psychology, sociology, cultural anthropology, engineering, and urban planning as well as architecture. Case studies act as an integrated, important and indispensable part of the curriculum in most schools of architecture.

In order to facilitate a holistic learning process and education, students need to participate fully in all the three processes of development of case studies as identified by Hancock (2017), analysing the case studies, interpreting the case studies into real design solutions by applying the concepts and ideas of design, building construction as well as applying graphical and drawing tools.

Kwok, (2003) identifies the use of case studies as an educational method employed in architectural design pedagogy in a variety of ways. Frequently, these case studies are presented as studies of completed buildings emphasizing issues such as information about the building, its design process or how the designer handled challenges peculiar to the building. However, ----- Go ahead to explain that oftentimes, the design process, no matter how crucial to the design output is neglected and the case study report is mostly anecdotal.

Anecdotally speaking, the use of case studies in architectural design pedagogy has received little attention among Nigerian educators and only a few authors have attempted to give a guide as to how studies into the built environment should proceed. Among them are Uji (2009) Oluigbo (2016). In conducting these case studies into the built environment parameters to be considered, according to Uji (2009), include the client, the consultants and the contractor's opinion about the building's performance; functionality of the spaces provided, circulation, construction materials, structural form and aesthetics. The extent to which the goal of the design is achieved should also be investigated. Similarly, Oluigbo (2016), provided a framework that combined design documentation with theoretical data collection and analysis particularly for masters' students. According to him the existing buildings being studied could be described based on the subject matters that

include history and background, site planning and landscaping, form and expression, structure and materials, as well as building services.

While Uji and Oluigbo's framework might be appropriate for the students in first or second year of study, the more advanced student needs to be able to evaluate buildings using a more standardized precedents' analysis framework.

Precedent based learning initiates from the consideration of earlier examples. This learning approach is stimulated by explicit analysis of previous works of architecture (Guney and Van den Toorn, 2011). Precedent analysis could be a quick exercise or it could be pursued in-depth depending on the goal of the study– whether to obtain a few ideas or just one notable one from multiple projects. The goal could also be to conduct an in-depth analysis of a few projects in which case many categories would be viewed and studied (Clement, 2012). Therefore, there is much to be learnt from existing buildings that could help develop ideas for one's own project by observations and on the spot discussions (Van der Voordt and Van Wegen, 2005).

Again, building performance should ideally be measured by the client's requirements. However, for the student conducting a precedent study this might not be readily available. In such instances, the student could rely on generally acceptable performance standards of buildings and those perhaps peculiar to such building types under study. Architectural precedents' value could be described by their performance, operation and morphology— the POM system (Tzonis, 1992). According to Guney and Van den Toorn, (2011) most studies centered on analyzing architectural works are based mainly on morphology— that is configuration/ spatial organization. The concept of performance in relation to function and operation attributed to Alexander Tzonis is of major importance for design methodology since it lays the foundation for integrating experiences from former plans into contemporary design.

The POM system

According to Tzonis, the POM system relates issues that express broadly architectural knowledge, fundamental concepts and structures which contain evidences in precedent, principles and rules of Architecture. It thus suits the reasoning mechanism that guides and develops architectural needs into design products (Tzonis, 1992). Its attributes and composition enables the mechanism to aid design explanation, generation and could be adapted for precedent analysis in design pedagogy. The POM system relies mainly on four major components that include Performance, Operation, Morphology and Context with performance and operation usually related.

Performance could be examined using variables of functionality, safety and physical state across the life cycle of a building in its anticipated or actual performance conditions. Students need to analyse building performance in order to appreciate users' interaction with existing buildings and comprehend prevailing situations with regards to the overall building efficiency. Also, students need to analyse how the form and operation of the

building enhance its performance. These can be summed up as a means of grounding student design approaches in reality and giving them the experience and tools to be able to do so (Stevenson, 2014). Operation of a building refers to the functional state, the manner in which the building form allows ease of way finding, facilities and equipment mechanism, control, and maintenance- ability. Operation implies the use of the building and the role the building form plays in this process (Tzonis and Heintz, 1995) such as linking people, equipment and objects with activities hosted in the building (Tzonis 1992).

Urban building's formal aspect in its spatial composition, materials' structure and its artifact attributes constitutes its morphology (Tzonis, 1992). Moreso, buildings' form is examined through its physical properties (Fang 1996). Thus, configurational attributes and physical constitution of design products constitute the morphological features for examination. Context refers to the situation, background and environment within which the buildings is located. Again, it is important to note that morphology, operation and performance are related. This relationship Tzonis illustrates with a corridor's specific shape which defines its morphology and an advantage of peoples' safe evacuation potentials (related to the performance and operation) with lighting conditions of particular context. Utility functions and cultural functions are typical contextual components of buildings to be examined. Consequently, Van der Voordt and Van Wegen (2005), categorized the functions of buildings into utility functions and cultural functions. Utility functions on one hand include protective functions, domain/territorial functions, spatial organization of activities and climate regulation. Cultural functions on the other hand include social function, cultural function as well as economic functions. However, Zarzar (2003), asserts that the function a building is designed to attain determines its performance. Thus, performance of a building indicates the requirements that conditions the building for possible use satisfactorily as intended and expressed in measurable terms that are objectively verifiable.

Accordingly, buildings are evaluated for their reachability, parking facilities, accessibility, construction, efficiency and ergonomic, as well as fire and public safety. Also, the physical conditions— lighting, noise, heating, draught, privacy, spatial orientation, building physics and overall environment. Van der Voordt and Van Wegen, (2005) enumerated the functional quality of a building to include the protection of people and property from harmful effects of wind, rain and inquisitive people; domain or territorial function which makes operation possible with others' influence thus ensuring security and privacy; social function that create spaces and places to carry out activities that define the quality of life effectively and cultural function relating to form and character of the spatial environment. Similarly, they referred to the functional quality of a building as the extent to which it provides a proper level of support to the desired activities, creates a pleasing interior climate, has a positive symbolic or cultural meaning and contributes to a favourable economic return and an optimum price–performance ratio. Therefore, a functional building is a building that is

suitable for the activities for which it was intended. The people inside the building must be able to function efficiently, comfortably, healthily and safely. This means that people must be able to reach and get into the building easily and move round the building comfortably. The building must be sufficiently in harmony with human perceptions– in the way it looks sounds, smells and feels. People must also feel physically comfortable, which means that the building must not be too hot or too cold nor must it be dirty, dark or noisy. People must be able to see how the parts of the building fit together and able to find their way round. All kinds of psychological needs must be considered. For instance, the need for privacy, social contact, freedom of choice and autonomy are crucial for consideration. The building must also be capable of being adjusted to suit changing circumstances, new activities and different users. With this as a basis, the concept of functional quality could be measured from nine aspects: Reachability and Parking facilities; Accessibility; Efficiency; Flexibility; Safety; Spatial orientation; Privacy; Territoriality and Social contact; Health and as well Physical well-being and Sustainability.

METHODOLOGY

The study in exploring the phenomenon of students' format of analysing precedents in their design projects adopted Tzonis' (1992), POM system for precedent analysis as methodology. The POM system approaches precedents from four critical assessment components comprising Performance, Operation, Morphology and Context. Thus, the evaluation criteria for precedents analysis were based on these sub-categories as indicators while the attributes examined and used to measure the indicators were developed from appropriate previous research works. In order to achieve this, the research question requires that information be solicited using a structured questionnaire and document checklist for examining previous theses submitted to the department. To scrutinize precedents' analysis phenomenon the research adopted Yin's (2003) case study research strategy which adequately outline five components of case study research asserted to be appropriate due to the research's focus on a phenomenon and contemporary issues. Advantageously, case study research helps refine and optimize the understanding of ideas (Stake, 2010). Therefore, to understand Architecture students' precedents' analysis process and archival content, the research qualitatively considered a case study strategy.

Purposefully, focusing on Department of Architecture the researchers selected Federal University of Technology Minna, Nigeria for the study. Students in their third, fourth and fifth year of study were considered eligible for participation in filling the questionnaire. Also considered fit to provide data were students who are in the master's degree programme. These categories of students gave a total population of 268 from which a sample of 200 respondents well distributed across the levels was randomly selected to partake in the study. However, 184 forms were returned accounting for 91.5% response rate. These groups are considered to be highly developed in design reasoning and thinking, creativity and having

adequate understanding of precedent procedures and analogies leading eventually to inventive design ideas. Subsequently, two evaluation criteria based on related research works were advanced. Observation checklist and questionnaire form were used to solicit information. They were based on questions related to the background and covers Tzonis' four orders categorized for the POM system using a five-point Likert scaling system ranging from "strongly agree to strongly disagree" as response format. The data solicited was analysed using regression analysis with statistical criteria for interpreting the findings.

RESULTS AND DISCUSSION

Three methods of analysis were employed for the data solicited from the field. First, descriptive and inferential statistics was used to process the information derived through questionnaire survey. Secondly, qualitative content analysis was used to process information deduces using observation schedule. Descriptive analysis shows that an average of 65% of the respondents have completed between 4 and 11 design studio projects while 32% have attempted 1-3 and the remaining 3% have completed 12-15 design projects. This implies that the sample has been exposed to to studio learning experience after attempting several studio projects. Accessibility to building was identified as the major challenge faced by students while conducting precedents studies of buildings with 122 attestations recorded from the respondents. Security and lack of guidance recorded 74 and 73 attestations respectively leaving difficulty in identifying appropriate case study with least attestation of 23. This indicates that they are not able to conduct in-depth evaluation, thereby raising the need to examine the method adopted by students in conducting case studies. Observation schedule stood out as the main instrument used for precedent analysis recording 123 confirmations. Questionnaire and Interview guides recorded 55 and 44 confirmations respectively. Additionally, 45 confirmations were distributed among Internet sourcing (21), Photographs (15) and use of sketches (9).

Afterwards, the Likert scaled questionnaire items where first subjected to reliability statistics test in order to establish the internal consistency of the items contained in the questionnaire instrument. Accordingly, the four factors represent 60.4 percent of the variance of the variables. Building performance consisting of fifteen variables (alpha = 0.83). Morphology was loaded with ten variables (alpha = 0.81) while Context contained eleven variables (alpha = 0.84) and Building operation was loaded with twelve variables (alpha 0.84). The overall reliability was conducted on the 48 questionnaire items as they were subjected to reliability test and alpha = 0.935(see Table 1), a value above the allowable threshold. Subsequently the items were weighed through confirmatory factor analysis conducted on Building Performance, Morphology, Context and Building Operations. This was to ascertain the factors that weigh higher and contribute more in establishing the factors. In other words, to identify strong and weak variables both for the acceptance of the variables in the factors' composition as well as for further regression analysis. In order to achieve this principal

component analysis was used as an extraction method which resulted in their loading values ranging between 0.523 and 0.806 thus based on these values they fit into the factor models and are also accepted for subsequent regression analysis. Furthermore, the Berrlett's test of sphericity confirmed the correlation of variables within the factors, while the measure of sampling adequacy using Kaiser-Meyer-Olkin (KMO) indicated practical level of common variance with KMO = 0.854 (see Table 2) thus factor analysis is appropriate.

Further still, regression analysis was used to ascertain the level at which the precedent assessment variables adopted in the instrument provide predicting explanation on the students' case study approaches. Thus, relating their comprehension of the process and adoption during case studies of architectural precedents. The regression analysis results show that a statistically significant relationship exists among the variables measured, thus the models fit the data and are acceptable as the independent variables explaining the dependent variables in the four models. Specifically, the analysis revealed that in Model 1 – Building Performance (R^2= 0.24, Adjusted R^2= 0.29, P< 0.01) which shows that only 24% of the variation was explained. For Model 2 – Morphology (R^2= 0.20, Adjusted R^2= 0.16, P< 0.01). It means only 20% of the variation accounted for morphology, as for Model 3 – Context (R^2= 0.23, Adjusted R^2= 0.19, P< 0.01) and for Model 4 - Building Operation (R^2= 0.20, Adjusted R^2= 0.15, P< 0.01), thus 23% of the total variation accounted for context and 20% accounted for building operation respectively. So, the proportion of the variation in the variables that accounted for Building Performance, Morphology, Context and Building Operation are statistically significant.

In sum, Building Performance, Morphology, Context and Building Operation clearly show a positive effect on precedent analysis from the data exploration. Although the results can be considered statistically significant in most parts and the data supports the supposition measured in the multiple regressions, the strength of the relationship between the independent variables and dependent variables indicates low level awareness of students on the concept of precedent analysis.

Taking a qualitative approach, data was solicited from previous undergraduate and master's degree thesis submitted within the past five years using a checklist. By means of ranking based on a five-point scale measure; where 1 = Very Comprehensive, 2 = Comprehensive, 3 = Fair, 4 = Sketchy and 5 = Poor the theses were examined by a jury consisting of experts who have been teaching design for not less than ten years. Their submissions were computed and the average for each factor comprising of average summation of other variables were established.

Table 1. Reliability Statistics, KMO and Bartlett's Test

Cronbach's Alpha.935	Cronbach's Alpha Based on Standardized Items.937	N of Items48
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.854
Bartlett's Test of Sphericity	Approx. Chi-Square	3963.675
	Df	1128
	Sig.	.000

Table 2Variables Measured.

Model	Dependent Variable	Independent Variables-Predictors (constant)
1	Building Performance	Aesthetics, Stakeholders perception, Material durability, Privacy, Inventory of functions, Building sustainability, Ergonometric safety, Building services, Circulation patterns, Fire safety, Environmental friendliness, Flexibility of building plans, Building safety, Structural stability
2	Form Morphology	Space sizing, Spatial configuration, Colour of elements, Structural elements, Building Geometry, Building direction, Distribution of components, Texture of elements, Building positioning
3	Context	Design principles, Site planning, Cultural or Symbolic meaning, architectural style, Geographic condition, Legal requirements, Historical background, Fitness to environment, Zoning regulations, Relation with other buildings
4	Building operation	Cost comparison, Landscaping elements, Efficiency of lift elevator, Artificial lighting, Facility reachability, HVAC system, Facility sustainability, Installation of fire measures, Facility accessibility, Acoustic effectiveness, Packing facilities

Table 3Regression Analysis - Model Summary

Model	R	R2	Adjusted R2	Std. Error of the Estimate	Change Statistics R Square Change	F Chang	df1	df2	Sig. F Change
Building Performance	0.545	0.297	0.240	0.792	0.297	5.141	14	170	.000
Form Morphology	0.453	0.205	0.164	0.932	0.205	4.996	9	174	.000
Context	0.485	0.235	0.191	0.963	0.235	5.346	10	174	.000
Building operation	0.448	0.201	0.150	0.854	0.201	3.958	11	173	.000

Thereafter scores were rated to view the general opinion of these experts in assessment of the level of compliance with the precedents analysis indicators during their case study assessments. A total number of fifteen theses labelled using codes A to O were randomly assessed until data saturation occurred. The result as contained in Table 3 shows that generally the students were rated poor in the application of the four precedents analysis indicators as contained in the POM system. It therefore means that the indicators are not adequately understood by the students because even where these indicators appeared in the theses they were inadequately measured. Such an outcome could mean that there is an absence of a proper precedents assessment framework as partially observed from the case study report pattern in the theses or that the mentors do not provide the required guidance.

Table 4 Content Analysis of Observation Checklist. (Scale - Very Comprehensive = 1, Comprehensive = 2, Fair =3, Sketchy = 4 and Poor = 5) (Rating

	Indicators	Students' Thesis Jury Analysis														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
I	Building Performance Metrics															
	Average Score	2	4	3	4	3	3	1	3	1	1	1	3	1	2	1
	Rating	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ii	Building Operation															
	Average score	2	5	2	4	4	3	1	3	0	5	3	1	4	1	3
	Rating	5	4	5	5	5	5	5	5	5	4	5	5	5	5	5
iii	Morphology															
	Average score	2	2	1	3	1	0	0	2	1	1	1	0	1	3	1
	Rating	5	5	5	4	5	5	5	5	5	5	5	5	5	4	5
Iv	Context															
	Average score	2	2	2	2	3	3	1	3	2	2	2	2	2	1	1
	Rating	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

SUMMARY AND CONCLUSION

The primary goal of this study was to explore the assessment process of existing buildings by students of Architecture during case study as a requirement in studying design. This was examined in relation to POM system as indicators with their variables derived from literature. The models developed shows statistical significance in the relationship between the exogenous and the endogenous attributes. However, the low value recorded in the coefficients is indicative of inadequate understanding and application of Precedents' analysis principles. This is in agreement with the results from univariate analysis that shows a high percentage of students confronted with problem related to lack of accessibility to buildings being studied, security challenges as well as lack of adequate mentoring even as observation remains the main method adopted for Precedents' Analysis. Similarly, the result from content analysis of data recorded from observation indicates a poor application by undergraduate finalists and masters students of precedent analysis principles.

Significantly, this study has initiated discussion on design case study assessment approach in Nigerian universities. It has also successfully established the lack of proper precedent study framework leading to the need for operative guidelines for precedents analysis in order to assess the built environment by students in Nigerian universities. It then calls on regulatory agencies and professional bodies to assist in the provision of platforms where information of important buildings can be assessed for research purposes.

LIMITATIONS AND FURTHER RESEARCH

Even though the results show statistical significance in all the models, the study has some limitations that could affect the reliability and validity of the findings. First, the regression models recorded low coefficients. Second

although the sample size is large enough for statistical analysis its focus on one case study only makes it illustrative and findings cannot be generalized. Third, the study did not establish the knowledge level of the mentors and experts with regards to the principles and concepts of precedent analysis as the focus was only on the students. Consequently, we could not define the framework adopted by these students as our basis of measurement was concentrated on POM system. Similarly, the variables utilized for measuring the indicators are subjective and inexhaustive by the models, but limited to those mentioned.

These limitations pave the path for future research. Covering a bigger sample that includes more universities can lead to possible empirical generalization. A more holistic scope that will examine the mentors and design tutors as well as design jury sessions could lead to the formation of Precedent assessment framework for architectural design pedagogy in Nigerian universities.

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APPENDIX I

Questionnaire

Form No ☐☐☐☐

Precedents' Analysis Approach by Architecture Students of Nigerian Universities

Precedents' analysis is an integral part of the design process as taught in the architectural design studio. This questionnaire is aimed at examining how architecture students studying in Nigerian universities approach precedent analysis of existing architectural works. The survey is strictly for academic purpose and aimed towards establishing a precedents analysis framework for Departments of Architecture in Nigerian universities. Any information provided will be treated with optimal confidentiality, thus your honest response is required.

SECTION A. Bio-Data and preliminary information

1. Year of study 300 level ☐ 400 level ☐ 500 level ☐ Masters ☐
2. Number of design studio projects completed to date. 0-3 ☐ 4–7 ☐ 8 – 11 ☐ 12 – 15 ☐
3. Identify the challenge(s) you have encountered while conducting precedent studies (case studies).
   Security ☐ Identification ☐ Accessibility ☐ Lack of guidance ☐
4. Identify the Guide / Instrument you've employed in the conduct of the precedent study.
   Observation checklists ☐ Questionnaire ☐ Interview guide ☐
   Others (specify).....

SECTION B. Significance level of checking for Precedents' Study attributes during Case studies.

	Building performance	1	2	3	4	5
1	Examining building performance is integral to precedents' analysis.					
2	I prepare an inventory of functions accommodated within a facility whenever I conduct a precedent analysis.					
3	I examine stakeholders' (client, contractor and users) perception about the building's performance.					
4	I examine the level of privacy afforded to the occupants by the buildings.					
5	I examine if the buildings' plans are flexible.					
6	I examine the ergonometric safety of the building.					

7	I examine how safety of the building for the public's use.					
8	I examine both vertical and horizontal circulation patterns in the building.					
9	Fire safety is one of the attributes examined.					
10	I examine the structural stability of the building.					
11	I examine environmental friendliness of the building.					
12	I examine the building's level of sustainability.					
13	I catalog the Materials employed and explore their durability and appropriateness.					
14	I take into cognizance the building services available during precedent analysis					
15	I examine the aesthetic attributes of both the interior and exterior components of the building.					

Please indicate the significance you attach to these attributes while conducting precedents' studies (case studies) for your design proposals/projects. Provide your responses guided by the legend- Strongly Agree [1] Agree [2] Neutral [3] Disagree [4] Strongly Disagree [5].

	Operation	1	2	3	4	5
1	Studying the mode of building operation is essential to precedent analysis.					
2	In analyzing a building, I study the effectiveness and adequacy of the parking facilities.					
3	I access the appropriateness of landscaping elements employed.					
4	I examine artificial lighting control in facilities studied.					
5	I examine the building's acoustics' effectiveness.					
6	I appraise fire safety measures/ installations put in place within the facility.					
7	I examine the efficiency of the lift /elevator system in the facilities studied.					
8	I examine the HVAC (heating, ventilation and air conditioning) system within the building studied.					
9	I appraise the facility's accessibility for both visitors and users (e.g. ease of locating the entrance).					
10	I access how reachable the facility is and how this reachability is achieved.					
11	I examine how sustainability is achieved in the building (e.g. energy savings, conservation of natural resources/ ecological friendliness).					
12	I investigate the cost of putting up the building against cost of maintaining it.					

	Morphology	1	2	3	4	5
1	Accessing the form/morphology of a building is a key aspect of precedents analysis.					
2	I access the spatial configuration of the building and determine the main organizing idea(s) [linear, axial, grid, central, clustered or radial].					
3	I explore the distribution of major components of the whole scheme (e.g. number of rooms; toilets)					
4	The shape/ geometry of the building is one of the features I usually study.					
5	I examine the positioning of thebuilding on site.					
6	I examine how the structural elements give the building its form.					
7	I examine the direction of the building(s) and the individual components.					
8	I take note of the colors of the various elements of the building.					
9	I take note of the textures of the building's various elements.					
10	I endeavour to find out the size of spaces and the overall size of the facility.					
	Context	1	2	3	4	5
1	There is the need to consider the context when investigating a precedent.					
2	I examine the geographic conditions within which the building is situated.					
3	I research into the history and background of the building project					
4	Site planning forms part of my investigations.					
5	I examine how the building fits into the environment and relates to other buildings around it.					
6	I evaluate how the building meets up with legal requirements.					
7	I examine whether or not the building adheres to zoning regulations.					
8	I explore how the building relates to other buildings of the same era.					
9	I consider any cultural or symbolic meanings attached to the building or parts of it.					
10	The architectural style of the building forms are part of components I examine.					
11	I study the design principles that the building's architect employ.					