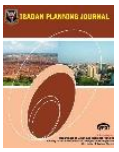
IPJ Ibadan Planning Journal
December 2023,
Vol. 9, No.1&2, 11-22

Ibadan Planning Journal
journal homepage: http://journals.ui.edu.ng/index.php/ipj/issue/view/7



# Perceptual Evaluation of the Factors Affecting the Maintenance of High-rise Residential Buildings in Lagos, Nigeria

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**Abstract**

*Maintenance of buildings, especially high-rise types, poses a major challenge to resident property managers who are saddled with the responsibility of sustaining property value, building quality, and users' satisfaction. This is without prejudice to particular factors that affect the condition of such building development. Hence, this study had the general objective of determining the factors that challenge the maintenance of high-rise residential buildings. Case study research design was adopted using a high-rise, multi-tenanted residential development in Lagos, Nigeria. Total enumeration survey and questionnaire administration was undertaken on respondents in the 155 residential units in the case study. The survey had 85.81% (133) return rate and the data derived from duly completed copies of the questionnaire were analysed using descriptive statistics. Major findings of the study suggest that design and poor workmanship, inadequate construction supervision, low quality of original construction, wear and tear, as well as ageing are the key factors that affect the condition of the high-rise residential development. Moreover, variables such as delay in carrying out repair works, service charge administration, outsourcing of services, disconnect between owners and managers, as well as late response to complaints are indicated as posing the major challenges to maintenance management of the high-rise building. This study adopts a case study approach; however, it does not limit the insights and the positive contributions to knowledge therefrom. The study provides significant information that could guide the maintenance decision-making of built-environment professionals with regards to factors of building condition and challenges of maintenance management of high-rise buildings. Also, this study constitutes a significant contribution to the subject of maintenance and management of high-rise buildings in emerging economies like Nigeria.*

**Keywords**
Maintenance management, Factors, Challenges, High-rise, Residential

**Article History**
Received 16 September 2020
Accepted 01 December 2022
Published online December 21, 2023

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**Declaration of Conflicting Interests**
The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## 1. Introduction

Housing ranks as the second most important basic need of man after food, serving as a shelter against adverse and inclement weather conditions (Manomano & Tanga, 2018; Adeleke & Olaleye, 2020; Adeleke, 2021). It enhances human dignity, welfare and his overall quality of life and thus viewed as a status symbol (UK Essays, 2013). Again, it contributed to the advancement and growth of developed nations (Sun, Zheng, Geltner & Wang, 2017) and it is a veritable source of wealth for more than seventy percent homeowners in economies such as America and Britain (Gorea & Midrigan, 2017).

The capital-intensive nature of residential property development makes it unaffordable for a considerable proportion of urban dwellers, hence, the need for this category of people to resort to renting residential apartments. Given space limitation within the metropolis and the expensive nature of the limited available lands, developers resort to creating high-rise apartments to optimise the use of land and accommodate a large number of people (Kavilkar & Patil, 2014; Osunsanmi, Ajayi & Afolayan, 2017; Jotwani & Nagar, 2018).

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However, every dwelling unit intended for use as human habitation is expected to comply with minimum standards of fitness for human habitation in accordance with applicable laws (Ogunbajo, 2016). The primary purpose of buildings in modern times is more than that of ordinary shelter but to provide occupants with conducive, safe, healthy and secure indoor environment to carry out different activities (Ibem, Opoko, Adeboye & Amole, 2013). In order to achieve this purpose, buildings are designed, planned, constructed and managed based on standards and specifications established by governments, professionals and experts who are supposed to have adequate knowledge of users' needs and expectations (Ibem *et al.,* 2013). Conversely, with respect to high-rise building, maintaining these standards and specifications poses a major challenge to resident property managers, compared to low-rise buildings due to their peculiarities: in terms of challenges associated with housing more families in relatively limited space (Kavilkar & Patil, 2014); the complex design, integrating advanced technologies (Whang, Flanagan, Kim & Kim, 2017); risks of fire outbreak and its possible severity (Zahari, Alimin, Sudirman & Mydin, 2014; Osunsanmi *et al.*, 2017); and the need for lifts/elevators as a result of multiple floors. Other issues requiring the expertise of the property manager include the provision of adequate water, waste disposal/management, cleaning of common areas, service charge administration, adequate power supply and maintenance of generators, security, telecom and air-conditioning gadgets, recreational facilities, timely rent collection and attending to structural defects, as well as supervision of contractors and services providers (Wahab, Ani, Sairi, Hussain & Surat, 2015).

Efficient management and maintenance of buildings is integral to retaining their value and quality, as well as helping users/occupiers to perform to their full potential by supporting their needs socially, psychologically and intellectually. Particularly, the uniqueness and complex nature of high-rise buildings in view of their design, development and management is such that they pose a plethora of challenges, hence the difference between their management and other property types.

The role of the property manager in sustaining the property value and the quality of the high-rise building must also incorporate paying adequate attention to the factors that enhance users' satisfaction. Hence, the management of the services and facilities is broad and critical, involving the mishmash and coordination of individuals, physical and monetary resources (Aliyu, Funtua, Mammadi, Bukar, Garkuwa, & Abubakar, 2016). Moreover, effective management and maintenance of high-rise building in a developing nation is a herculean task. This is with the consideration of incessant power outage, the imported technology utilised in the construction process and for which experts may be required to be flown into the country from other nations, amongst other problems. Also related to these are paucity of funds and attitudinal issues of owners, occupiers, property managers, contractors and bureaucracies within government agencies whose interventions may be required from time-to-time for the optimal and smooth functioning and operations of the property. Once the government or private investors invest a capital sum in the development of a housing project, repeated commitment of funds and manpower to keep the property in optimum condition may constitute a problem. Also, according to Iyagba (2005), it has become impossible to produce buildings which are maintenance-free, but maintenance work can be minimised by good design and proper workmanship, executed by skilled experts and competent craftsmen using suitable codes of installation, requisite building materials and methods. These recommendations may be particularly relevant to high-rise buildings in a megacity like Lagos, Nigeria.

Population growth of the world is projected to increase from 7.6 billion to 9.8 billion and 11.2 billion by the year 2050 and 2100 respectively (UN DESA, 2017) and Nigeria's population growth, estimated at 250 million, is expected to increase to 399 million by the year 2050 (UN DESA, 2017). Coupled with rapid urbanisation, being experienced in Lagos and other cities in the country presently, adequate housing must be provided to address the present and projected deficit. Thus, it is in the interest of the urban populace, developers, investors in residential building projects and the government of Lagos state, against the housing deficit of 3.5 million in the state (Opoko & Oluwatayo, 2014), that housing developments that fall short of optimal performance be reduced to the barest minimum, especially vertical buildings with its attendant enormous cost and technology sophistication. Accordingly, studies must be conducted concertedly

to evaluate the performance of high-rise residential buildings, to inform property managers and decision makers and other relevant stakeholders on the inherent challenges and measures to address them. This study is such an attempt, aimed at providing information regarding factors of building condition and challenges of management/maintenance of a high-rise building in Lagos, Nigeria.

Specifically, the aim of the study is to evaluate the condition and maintenance management of a high-rise residential building in Lagos, Nigeria from residents' perspectives with a view to provide information that will enhance efficiency and effectiveness of the maintenance management. In achieving the aim, the specific objectives of the study are to examine the factors influencing the condition of the high-rise residential building and evaluate the challenges of maintenance of the high-rise residential building from residents' perspectives.

## 2. Literature Review

Various studies have been conducted on the management and maintenance of residential high-rise buildings to evaluate the condition and the performance of the maintenance practices. Aliyu, Ahmad and Alhaji (2015) carried out an appraisal of the facilities management strategies in two commercial high-rise buildings in Jos, Plateau state, Nigeria, with a view to understand the effectiveness of the practices and possible problems being encountered. The findings revealed that the prominent challenges encountered by the facility managers include bureaucracy bottlenecks from the administration, failure to promptly execute repairs and replace faulty items or outdated ones. However, the study primarily focused on the facility managers and did not appraise the level of the management performance from the perspective of the residents.

Ajetomobi and Olanrewaju (2015) carried out an evaluation of the factors affecting the maintenance of public and private housing in Nigeria, with the aim of proffering probable solutions to identified problems. Findings of the study showed that the most significant factors affecting the quality of housing maintenance are: failure of the design and proper workmanship, material specifications, construction supervision, detailing of working drawings and cash flow analysis. In another context, Aliyu *et al*. (2016) identified the problems associated with the management of multi-tenanted high-rise commercial buildings in Kaduna metropolis. Primary data were collected through the administration of questionnaire. Findings revealed that the major challenges in maintenance of the high-rise buildings were poor facilities' management and inadequate funding.

Wahab *et al.* (2015) examined the parameters of building maintenance issues at high-rise residential building from year 2005 to 2013. The authors identified basic amenities provided in a high-rise building that needed to be jointly used to include parking space, elevators, waste disposal system, 24 hours security system, and recreational facilities, amongst others. The use of these amenities requires that the occupants cooperate with the managers in maintaining them, such that they are maintained in good condition. The study classified the maintenance and management issues in a high-rise building into three components, namely, those pertaining to: funding, efficiency and satisfaction. These issues thus formed the basis of assessment of the performance of the residential high-rise building, in the context of the efficiency in management of such properties. The findings of the study indicated that the issue of funding is paramount to the maintenance and management of such buildings, followed by efficiency in management, while satisfaction was the least parameter. Musa and Musa (2018) evaluated the housing satisfaction level among the residents of a low-cost high-rise building, relative to the maintenance activities being carried out by the property managers. The findings showed the residents were mostly dissatisfied with the quality of the maintenance of services and facilities being rendered in the property.

Khalid, Ahmad and Sakdan (2019) investigated the challenges of high-rise buildings' management and maintenance in the context of residential and commercial properties. The findings revealed that the longevity of buildings is a function of the volume of maintenance undertaken by relevant actors. Accordingly, teaming up of the actors is very important for the sustenance and success of high-rise buildings.

Azian, Yusof and Kamal (2020) evaluated the performance indicators of residential high-rise buildings by identifying the inherent challenges based in managing such buildings. From the perspective of property managers, challenges in

meeting the residents' expectations and needs emanate from deficiencies in the design, plumbing problems, delays in executing repair and maintenance work, inadequacy of public facilities, incompetent security and rent, as well as service charge defaults. The authors recommended cooperation between the property management team and the residents in order to mitigate the problems and ensure an excellent condition of the high-rise residential building.

Opara, Idowu, Hungbo and Akinsanya (2022) investigated the strategies of maintenance management employed for high-rise residential buildings and the attendant challenges. The authors submitted that in order to promote an increase in the life cycle of the building and curb incessant breakdowns and deteriorations, an excellent maintenance management is crucial. The study recommended a continuous review of the maintenance management practices at regular intervals, to measure the rate of the performance and ascertain the quality of the service.

Au-Yong, Ali and Chua (2019) undertook a review of literature to formulate a theoretical model and a research orientation for further researches on issues of maintenance of high-rise residential buildings. The authors undertook a categorisation of building services and facilities with the aim of providing a direction to future research. The study posited that routine management inspections and maintenance affect the maintenance performance of high-rise residential buildings. On the other hand, Bako (2020) investigated the challenges that facility managers are confronted with, in ensuring effective and efficient maintenance management in the Nigerian building industry. The author reported that the challenges of the facility managers are internal and external in characteristics. Some of these challenges include manpower, equipment and machinery, risk management, operational efficiency, stakeholder requirements and finance. The author further opined that there is a general inadequate commitment to maintenance management by responsible funding agencies and stakeholders in Nigeria.

Achoru (2015) opined that effective maintenance and management of high-rise buildings will require the combination of several integrated processes, which may be far from the know-how of the average property owner. This is because the challenges of maintenance may include structural problems, service charge administration, inefficiency of outsourced contractors, cleanliness of common spaces and facilities, and such likes. The author noted the importance of timely maintenance and management interventions in forestalling degradation of the state of repairs of buildings.

Besides, the challenges of maintenance management of high-rise buildings include lift breakdown, insufficient parking, cleanliness and waste management (Azian *et al.,* 2020). Studies have also reported that residents complained of inadequate facilities management such as dysfunctional lifts, garbage collection not according to schedule, dissatisfaction with the cleanliness of general areas and drains, and vandalism, amongst others (Mohit & Nazyddah, 2011; Vergara, Gruis & Van der Flier, 2019). When such problems persist and/or not promptly resolved, there is tendency for the property to enter into redundancy or become physically, functionally and financially obsolete, at the detriment of the developers who had committed a huge capital outlay to execute the project. On the contrary, buildings wherein the managers succeed in enhancing the performance, optimise efficiency and sustains users' satisfaction (Alagbe & Aina, 2020), by providing an enabling environment to achieve their full potential tend to enjoy more patronage and be in incessant demand with limited void periods. In essence, keeping a property in optimum physical condition guarantees maximum returns on investment while prolonging its economic life.

## 3. Methodology

Case study research design was adopted in this study. The case study is an imposing residential development located along a major road within the popular Victoria Island area of Lagos State, Nigeria. The name of the residential development could have been specifically mentioned in this study but for confidential and ethical constraints. The development comprises three imposing 21- storey blocks and an annex building on 4 floors, aptly named Block A, B, C and D. The residential blocks of buildings are arranged in the form of an arc within the premises. Each main block consists of forty-one 3-bedroom flats (each room ensuite toilet and bathroom) and 4 shops. There are 42 car parking lots on the basement of each block of flats. The annex building consists of thirty-two 1-bedroom flats on two wings (Wings A and B with sixteen 1-bedroom

flats each). In all, there are 155 residential units in the residential development.

Each of the main blocks has three elevators and there are two alternative stairways in each block – one for movement to and fro the upper floors and the other designed as escape route. Three industrial boreholes serve to provide water in the premises; together with two 10,000 liters capacity water treatment plant and 50,000 liters filtration device. The onsite water provision also includes two 30,000 liters underground tanks, two 15,000 liters overhead tanks, one 10,000 liters overhead tank, and six 15HP transfer pumps; all located strategically within the premises.

Electricity power source is via connection to public mains electricity power supply, which is routed through three 500KVA step-down transformers that are installed on site. Alternative power supply is via 2 electricity generators – 750 KVA and 350 KVA – with appropriate and applicable electrical control panels. A sewage treatment plant, with adequate pump capacity and appropriate containment capacity, is located at the rear side of the premises. Other facilities provided within the residential development include: a swimming pool, a lawn tennis court, and children's playground with well-maintained lawn and garden. The staff and the service attendants of the premises include engineers, ICTpersonnel, builders, plumbers, electricians, gardeners, janitors, lift operators and security personnel.

The high-rise residential development under study comprises one-hundred and fifty-five (155) residential units. Instead of adopting a sampling procedure, total enumeration survey of the residential units was undertaken due to the relatively small size of the total population (Ajayi & Adewunmi, 2017; Ajiero, Antia & Akpan, 2022; Ogunba, 2015). Questionnaire was administered on responsive persons in each of the 155 residential units. Data collected with the aid of the questionnaire administration comprises socio-demographic and housing characteristics of the respondents, perception about factors influencing the condition of facilities and maintenance of the residential development, as well as the challenges of management and maintenance of the case study. The study's perceptual evaluation is based on the perceptions of residents, which comprised the study's respondents.

While the socio-demographic and housing characteristics of the respondents were measured as nominal and interval scales, factors influencing the condition of facilities and maintenance were measured using ordinal 5-point Likert scale (5 = Strongly Agree, 4 = Agree, 3 = Indifferent, 2 = Disagree and 1 = Strongly Disagree). Perceptions about the challenges of management and maintenance of the residential development were also measured using the same ordinal 5-point Likert scale. These scales were appropriately used with the hope that the respondents would have minimal difficulty in expressing their views with respect to the questions raised (Oladokun & Ogunbiyi, 2018; Ogunbiyi & Oladokun, 2022). The survey had 85.81% (133) return rate and the data derived from duly completed copies of the questionnaire were analysed using descriptive statistics. The descriptive statistics includes frequency counts converted to percentages as well as ranking of variable items based on their weighted mean score. The data analysis was done using SPSS Version 22.

## 4. Findings and Discussions

Findings and discussions based on the analysis of questions posed to the respondents are presented in the following sections.

### 4.1 Socio-demographic and Housing Characteristics of the Respondents

This section presents an examination of the socio-demographic characteristics of the respondents. The collected data include gender, age, marital status and nationality, among others. This was done to generate a profile of the respondents and also to provide an identity upon which their responses to questions that address the subject matter of the research can be dissected. The socio-demographic and housing characteristics of the respondents are presented in Table 1.

Table 1 reveals that 65.4% of the respondents were male while 34.6% were female. This shows that majority of the respondents were male. Findings also revealed that 78.2% of the respondents, constituting the majority, were married; 15.0% of the respondents stated that they were single. This shows that majority of the respondents were married, and being married with a family of one's own means that the facilities and services available to the housing unit would be specifically intended to cater for the comforts of the family.

Findings also show that 59.4% of the respondents (who were the majority) have household size of 4 – 6 persons, while 2.3% have household size of 7-9 persons. Although the composition of households can vary based on the ages of the parents, ages of the children and stage/level of education of the children, the typical household comprises father, mother and their children (Keilman, 1988). Therefore, it is no surprise that majority of the respondents have a household size of 4 – 6 persons.

Age distribution of the respondents is also conveyed by Table 1. This was done to specify a demographic classification of the respondents. Findings reveal that majority of the respondents (38.3%) were between 41-50 years of age, 29.3% were between 31 – 40 years and 17.4% were between 51 – 60 years. This implies that majority of the respondents were between 31 – 60 years. Usually, this age category of any population tends to be the most economically-active.

In Table 1 also, the type of residential units occupied by the respondents is presented. Results show that majority of the respondents (84.2%) occupy 3-bedroom apartments, while 15.8% occupy 1-bedroom apartments in the residential property. Two types of residential units within the subject property are: (a) the 1-bedroom apartment comprising a sitting room, one bedroom, a kitchen and the convenience units and (b) one 3-bedroom apartment that comprises a sitting room, 3 bedrooms, a kitchen and the convenience units.

**Table 1. Socio-demographic and Housing Characteristics of Respondents**

| Variables | Freq. (n=133) | % |
|---|---|---|
| **Sex** | | |
| Male | 87 | 65.4 |
| Female | 46 | 34.6 |
| **Marital Status** | | |
| Single | 20 | 15.0 |
| Married | 104 | 78.2 |
| Divorced | 5 | 3.8 |
| Widowed | 4 | 3.0 |
| **Age Category** | | |
| Less than 21 years | 2 | 1.5 |
| 21-30 years | 12 | 9.0 |
| 31-40 years | 39 | 29.3 |
| 41-50 years | 51 | 38.3 |
| 51-60 years | 23 | 17.4 |
| Above 60 years | 6 | 4.5 |
| **Type of Apartment** | | |
| 1-Bedroom Apartment | 21 | 15.8 |
| 3-Bedroom Apartment | 112 | 84.2 |
| **Highest Education** | | |
| School Certificate | 2 | 1.5 |
| First Degree | 74 | 55.6 |
| Masters' Degree | 49 | 36.8 |
| Doctorate | 8 | 6.1 |
| **Length of Years in Occupation** | | |
| 1-3 years | 17 | 12.8 |
| 4-6 years | 39 | 29.3 |
| 7-9 years | 46 | 34.6 |
| Above 9 years | 31 | 23.3 |
| **Household Size** | | |
| 1-3 persons | 51 | 38.3 |
| 4-6 persons | 79 | 59.4 |
| 7-9 persons | 3 | 2.3 |

Source: Field Survey, 2021

The academic qualification of the respondents was also examined and presented in Table 1. This was done to indicate how learned the respondents were, ascertain how well they could understand the questions posed by this research and characterise the quality of their responses. Results show that majority (55.6%) of the respondents have obtained a degree from either a Polytechnic or University, while 36.8% of the respondents are Masters' degree holders. 6.1% of the respondents have obtained a Doctorate degree. This indicates that the respondents are significantly learned and over 40% have postgraduate educational qualification, which is a major feat for any demography within the Nigerian population to be that highly educated.

Moreover, the length of time that the respondents have been in occupation of their apartments was enquired and presented in Table 1. This was done to relate their period of stay with familiarity with the running and quality of facilities and services available within the subject residential property. Results show that 34.6% of the respondents have been occupying the property for a period of between 7 – 9 years and were in the majority. While 29.3% of the respondents have been in occupation for a period of between 4 – 6 years, those who have been in occupation for a period longer than nine years were 23.3%. This shows that more than 85% of the respondents have been occupying the high-rise residential building for a

period of more than three years. This further depicts that the majority of the respondents have been in occupation long enough to understand and to provide perceptual evaluation of the condition of facilities and the associated challenges in the maintenance management of the residential development.

### 4.2 Factors affecting the Condition of the Residential Building

This section presents the respondents' perceptual evaluation of the factors affecting the condition of the high-rise, residential building. Various indicators were identified from literature and presented to the respondents for ranking in determining those factors that affect the condition of the subject residential development. The factors were measured on a five-point Likert scale as Strongly Agree (5), Agree (4), Indifferent (3), Disagree (2), and Strongly Disagree (1). The responses were analysed using Mean and Weighted Mean Score (WMS) techniques - with the sum total of all responses multiplied by the corresponding scores divided by the total number of respondents to have the WMS. The results are presented in Table 2.

Results show that design and poor workmanship ranked first with a mean of 4.96 among the factors affecting the condition of the building. This implies that the occupiers of the high-rise building observed poor functionality of some important components of the building as the most important factor affecting its condition. Further investigation reveals that some of the design elements of the building were done to mimic foreign buildings that could be found in the USA and Europe. Meanwhile, the said design considerations did not adequately factor-in the Nigerian weather – with incessant rains needing quick drainage and the constant heat that is present in this part of the world. Some of the design elements of the high-rise building could have been done better and this could have made this variable item less critical among the factors affecting the condition of the building. This finding agrees with previous studies, that the failure of building designs creates critical issues to the management of high-rise buildings (Ajetomobi & Olanrewaju, 2015; Azian *et al.,* 2020). Ajetomobi and Olanrewaju (2015), as well as Iyagba (2005), also noted that effective building maintenance largely depends on initial quality building design and proper workmanship.

Ranked second among the factors affecting the condition of the subject property is inadequate construction supervision with a mean of 4.85. This is another planning and design phase factor. The quality of construction supervision becomes more apparent during the use of a building. Aesthetic designs, without meticulous supervision to ensure that the constructions are carried out to detailed specifications, will not augur well for a building's functionalities. Therefore, the residents' perceptions reveal areas where the construction supervision could have been done better to ensure that the workmen installed the facilities and components of the building to the best of conditions. Poor workmanship may contribute to building failures (Iyagba, 2005). Ajetomobi and Olanrewaju (2015) also submitted that construction supervision eventually affects residential property maintenance.

**Table 2. Factors affecting the Condition of the High-rise Residential Building**

| Factors | Weighted Mean Score | Mean | Rank |
|---|---|---|---|
| Design and poor workmanship | 660 | 4.96 | **1st** |
| Inadequate construction supervision | 645 | 4.85 | **2nd** |
| Low quality of original construction | 634 | 4.77 | **3rd** |
| Ageing | 622 | 4.68 | **4th** |
| Wear and tear | 615 | 4.62 | **5th** |
| Users' activities | 601 | 4.52 | 6th |
| Environmental factors | 572 | 4.30 | 7th |
| Alterations and modifications | 563 | 4.23 | 8th |
| Inadequate housing stock | 544 | 4.09 | 9th |
| Gradual depreciation | 480 | 3.61 | 10th |
| Value of buildings | 450 | 3.38 | 11th |
| Social factors | 445 | 3.35 | 12th |
| Shifting values and modernisation | 437 | 3.29 | 13th |
| Inadequate waste management plan | 418 | 3.14 | 14th |
| Inadequate material specifications | 390 | 2.93 | 15th |
| Inadequate details of building drawings | 374 | 2.81 | 16th |
| Cash flow considerations | 345 | 2.59 | 17th |
| Preservation of historical background | 326 | 2.45 | 18th |
| Effects of solar radiation | 310 | 2.33 | 19th |

Source: Field Survey, 2021

Low quality of original construction is ranked third with a mean of 4.77 by the respondents. This suggests that the occupiers of the subject property consider some observable defects in the building as traceable to low quality of materials used in the building and its facilities. Any building where there

is low quality of original construction due to 'cutting-corners' to optimise returns and save cost will eventually pose significant problems to the condition and maintenance management of such building.

Ranked fourth with a mean of 4.68 is Ageing. Ageing is inevitable; the longer a building has been in existence, the more the components of such building might become obsolete and might not meet present-day needs. This may lead to the need to replace obsolete and outdated parts with more modern units that will meet the needs of current occupants. Also, the older a building is, the more will be the cost of maintenance as the various facilities, fixtures and fittings fall into disrepair and the need for replacements.

Wear and tear as a result of use is ranked fifth with a mean of 4.62. It is no surprise that the ranking is close to that of ageing; wear and tear comes about as a result of use. Over time, constant usage of building components and facilities will cause those units to gradually fall into old age in the lifecycle of the building. With time, the more the use, the more wear and tear and the more elements that need repairs and replacements in a building.

Other factors that were ranked significant to the condition of the high-rise residential building include:

- Users' Activities (6th ranked factor) – Whatever activities users of a building are carrying out will form a significant factor that will affect the condition of the building. Misuse and over-utilisation of facilities per household size play prominent roles in this factor.
- Environmental Factors (7th ranked factor) - The peculiar nature of climate and weather in this part of the world would require more diligence in the selection of building materials that could withstand high degree of humidity, rainfall and solar heat. Lack of more careful considerations seem to lead exposed components of the subject property to extreme weather; to a level that is greater than they were designed for.
- Alterations and Modifications (8th ranked factor) - Over time, through the life of a property, alterations and modifications are carried out that may not be part of the initial design of the property. Especially long-term tenants that may carry out subtle alterations over time, this may constitute a significant factor to the condition of the building and a major problem to the maintenance management.
- Inadequate Housing Stock (9th ranked factor) - The case study is quite unique as properties of its status per affordability is rare in the neighbourhood of Victoria Island, Lagos. Hence, the demand for apartments in the subject property is usually high. Further investigations reveal that the void period for new tenancy is usually very low, sometimes giving no sufficient time for corrective maintenance to be done before a new tenant moves in. If there is a larger housing stock for that income category, the intensity of demand will reduce, which will allow the maintenance managers to focus more on optimising the physical condition of the building.
- Gradual Depreciation (10th ranked factor) - As time takes its toll, building components become old, design becomes obsolete and occupiers' tastes become more sophisticated. However, depreciation is inevitable - be it physical, functional, economic, technological or social. It is only a matter of time before the discussion on whether the costs of maintaining the building components and facilities are worth it or there is need for retrofitting.

The five-least-ranked factors include inadequate material specifications, inadequate details of building drawings, cash flow considerations, preservation of historical background, and the effects of solar radiation. While these were indicated as factors affecting the condition of the high-rise residential building, their effects were perceptually evaluated by the respondents as less significant.

### 4.3 Challenges Associated with Maintenance Management of the High-rise Residential Building

This section presents the analysis of the residents' perceptions of the challenges associated with the maintenance management of the case study. A preliminary question was asked whether there are challenges in the maintenance management of the building. This was necessarily asked to examine the possibility of having occupiers who are fully satisfied with the maintenance operation of the building. As presented in Table 3, all 133 (100.0%) of the respondents indicated in the affirmative that

challenges exist in the maintenance management of the high-rise building.

Residents' perceptions about the challenges encountered in the maintenance management of the subject property is presented in Table 4. Various maintenance management issues were identified from the literature and presented to the respondents to rank on a five-point Likert scale, viz: Strongly Agree (5), Agree (4), Indifferent (3), Disagree (2), and Strongly Disagree (1). Their responses were analysed using Mean and the Weighted Mean Score (WMS).

**Table 3: Presence of Challenges in the Maintenance Management**

| Functionality | Freq. | (%) |
|---|---|---|
| Challenges | 133 | 100.0 |
| No Challenges | - | - |
| Total | **133** | **100.00** |

Source: Field Survey, 2021

**Table 4: Challenges in the Maintenance Management of the High-rise Residential Building**

| Challenges | Weighted Mean Score | Mean | Rank |
|---|---|---|---|
| Delay in carrying out repair works | 622 | 4.68 | **1st** |
| Service charge administration | 580 | 4.36 | **2nd** |
| Outsourcing of services | 539 | 4.05 | **3rd** |
| Disconnect between owners and managers | 530 | 3.98 | **4th** |
| Late response to complaints | 505 | 3.80 | **5th** |
| Cost Overrun | 504 | 3.79 | 6th |
| Tenant retention | 495 | 3.72 | 7th |
| Hiring quality staff | 481 | 3.62 | 8th |
| Government regulations | 455 | 3.42 | 9th |

Source: Field Survey, 2021

Delay in Carrying out Repair Works (with a mean score of 4.68) is identified as the most prominent challenge in the maintenance management of the building. According to the respondents, this suggests that the repair works could be done faster than what currently obtains. Majority of the respondents regard this as a major issue. Further investigation reveal that this challenge comes to bare especially on essential repairs that require substantial funds to be approved before they can be carried out. Delay in undertaking maintenance and repairs will ultimately lead a residential building to a deplorable state (Ogunbajo, 2013).

Ranked second with a mean score of 4.36 is service charge administration. Service charge administration has to do with how the funds paid for maintenance by the residents are used appropriately. This was indicated as the next most significant challenge in the maintenance management of the subject property. Further investigation reveals that payments by some residents are not as regular and timely as it should be. While some residents make payments and are expecting quality maintenance services, others delay such payments, thereby making it difficult for adequate preventive/planned maintenance to be carried out by the maintenance management team. This finding agrees with previous studies that the collection of maintenance fund is a major challenge in the management of high-rise buildings (Llewellyn, 2002; Tiun, 2009).

Outsourcing of Services is ranked third among the challenges of maintenance management of the high-rise building with a mean score of 4.05. This suggests that the repair and maintenance activities of outsourced service providers are not being adequately monitored and supervised. Overseeing the maintenance service delivery of outsourced providers would prevent shoddy works from being done. Else, outsourcing of some of the maintenance activities would continue to be to the dissatisfaction of the residents and will continue to call to question the efficiency of maintenance operations in the high-rise building.

Disconnect between owners and managers is ranked fourth with a mean of 3.98. The implication is that there are observable times when the maintenance managers and the property owners are at loggerheads with regards to repairs and maintenance activities. It is not enough to undertake property development for the sake of ownership and expected returns; significant investment would still be needed for planned and unplanned maintenance to be carried out to enhance, maintain, and sustain the value of a property investment. Sometimes, stakeholder requirements may be contrary to the challenges being faced by maintenance managers on site (Aliyu *et al.,* 2015; Bako, 2020).

Ranked fifth among the challenges of maintenance management of the high-rise building is late response to complaints with a mean of 3.80. This suggests that the respondents consider the speed at which repair works are being implemented to be too slow; leaving much room for improvements. In consideration of the substantial amounts of money being paid by the residents for annual rent and service charge, it is reasonable to

expect that they would require prompt execution of repair works and maintenance activities. Insufficient labour resource may limit the efficiency of maintenance managers (Bako, 2020).

### 4.4 Solutions to the Challenges Associated with the Maintenance Management of the High-rise Building

Table 5 presents the residents' perception of the solutions to the various challenges in the maintenance management of the high-rise residential building. Results show that 45.9% of the respondents stated that maintenance managers' freedom to operate is the most important solution. This suggested solution implies that maintenance personnel need to be given more free-hand to undertake repairs and maintenance without undue interference and hindrances of the laid-down bureaucratic processes of the property owners. This would go a long way in enabling more timely and effective maintenance planning, especially preventive maintenance activities. Facility maintenance managers need considerable freedom to operate if they are to effectively fulfill their responsibility of ensuing that the building facilities adequately support the activities of the users (Aliyu *et al.,* 2015; Bako, 2020; Brochner, 2003).

**Table 5: Ways Challenges could be Solved**

| Solution | Freq. | % |
|---|---|---|
| Maintenance Managers' Freedom to Operate | 61 | 45.9 |
| Adequacy of Maintenance Funds | 39 | 29.3 |
| Constant Maintenance Inspections | 33 | 24.8 |
| Total | 133 | 100.00 |

**Source: Field Survey, 2021**

Other 29.3% of the respondents indicated that, adequacy of maintenance funds will greatly improve the efficiency of maintenance operations in the building. It is one thing for the maintenance managers to plan to execute repairs and maintenance, it is another for the executives and property owners (who are in the seat of funds' approval) to make funds available. Availability and adequacy of maintenance funds will help in greatly solving repair problems before matters are escalated and before the needed repairs become detrimental to the health and safety of residents. Wahab *et al.* (2015) opined that maintenance fund is critical to effective management of high-rise buildings. Bako (2020) noted that finance is a major challenge to facility managers in undertaking efficient maintenance operations. Aliyu *et al.* (2016) also submitted that lack of funds hindered building maintenance activities.

Moreover, remaining 24.8% of the respondents maintained that constant maintenance inspections is necessary in solving some of the problems of maintenance management of the high-rise building. Routine maintenance inspection is a major requirement of effective maintenance management. It does appear that the maintenance managers are not doing this as much as expected by the residents. With regular maintenance inspections, issues of repairs can be quickly observed and corrected before they fester and become health and safety hazards to the residents.

## 5. Conclusion and Recommendations

This study examined the factors affecting the condition as well as challenges in the maintenance management, of a high-rise residential building located in the high-brow Victoria Island area of Lagos State, Nigeria. The study's original approach was to consider the perspectives of residents living in the subject property. Findings of the study reveal that the key factors affecting the condition of the high-rise residential building include design and poor workmanship, inadequate construction supervision, low quality of original construction, ageing, and wear and tear.

In examining the challenges in maintenance management of the high-rise residential building, results highlight the following major challenges: delay in carrying out repair works, service charge administration, outsourcing of services, disconnect between owners and managers and late response to complaints. Further inquiry reveals the residents' perspectives of the ways the challenges could be solved as comprising maintenance managers' freedom to operate, adequacy of maintenance funds and constant maintenance inspections.

The study concludes with a recommendation that a general review of the activities involved in maintenance management of high-rise residential developments should be conducted periodically to ensure that the perspectives of all the stakeholders involved are put into consideration. Moreover, bureaucracy in maintenance decisions should be reduced to the barest minimum to achieve timely and effective undertaking of maintenance activities.

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