CRITICAL FACTORS INFLUENCING MAINTENANCE MANAGEMENT OF PUBLIC BUILDINGS IN NIGERIA

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Abstract
Maintenance management of public buildings in Nigeria has suffered from so many influences for a considerable time. The sustainability of such maintenance demands serious attention. This study, therefore, assessed factors influencing maintenance management of public buildings as practiced by Nigerians, with the objectives of assessing the key factors influencing maintenance culture in public buildings, as well as solution to management decision to prompt effective maintenance of public buildings in Nigeria. In achieving these objectives, opinions of stake holders in the built environment and users of selected public buildings in Akure, the capital city of Ondo State, Nigeria, were sampled through structured questionnaires. In achieving the study's objectives, seventy-seven (77) questionnaires were retrieved. Frequencies, percentages and relative importance index (RII) were adopted in analyzing and ranking the results.The study concluded that design and construction defects/errors, poor workmanship, age factors due to wear and tear, corruption, occupants' style of use, lack of quality control and post construction prevention mechanism, were major factors influencing maintenance culture in public buildings. Also, the key factors influencing management decision to prompt effective maintenance of public buildings amongst many were status of the building, age of the building, availability of fund, political factors/influence and prompt release of fund, even when available. The study recommended that there should be strict compliance with maintenance culture and the usage of good materials at construction.

Keywords: Akure city, Buildings, Maintenance, Maintenance management, Public buildings

1.0. Introduction

Maintenance with its management, is an issue that is concerned with the planning and control of construction resource to ensure that necessary repairs and renewal are carried out with maximum efficiency and economy (Adenuga, 1996). This is because Ajibola (2009) saw maintenance as the work that is supposed to be done regularly to keep a building in good condition, and as near as possible in their original state, and that the management should always be seen as the dynamic link for such maintenance in its essence of time constraints, resources and how to stay within the maintenance budget (Chitkara, 2008).

Again, Pukite and Geipele (2017) cited in Olanrewaju and Awodele (2020), reflected that maintenance, together with its management, is an organized and effective system of maintenance operations, which is set up to deal with problems related to the upkeep of a building facility.

However, Iwaere and Lawal (2011) opined that public buildings are non-movable facilities like residential buildings, offices, schools, post-office, stadium, recreation and event centers, etc, that cannot change their locations. They are owned or being monitored by government either at federal, state or local government level. Adenuga, Odusami and Faremi (2007)submitted that maintenance management in the public sector in Nigeria has suffered from lack of funds for a considerable time.

Building maintenance is an important programme for the sustainability of infrastructural development (Baba & Buba, 2013). Since buildings are crucially to man's existence and survival (Eke, et al., 2017). It plays an important role in the actualization of the goals and objectives by satisfying the physical and emotional needs of the occupiers and users (Zulkarnainet al., 2011, Asabiaka, 2008). Sequel to this, Ogunmakinwa, Akinola&Siyanbola, (2013), maintained that maintenance of building must receive full attention from the users, designers and contractors and the financier. And that adequate funding and inspection routine by the maintenance department should be made sacrosanct (Eke, Musa, Fashubaa and Abass, 2017).

While it is impossible to produce buildings which are maintenance free, as opined by Iyagba and Adenuga (2003), Chitkara (2008) believed that management of public buildings amongst other things entails multidirectional interaction of dynamic forces represented by its time, resources constraints and maintenance costs.

Olagunju (2012) submitted that the management problem seems pronounced, most especially in developing countries (Nigeria inclusive) where very little emphasis is laid on building maintenance functions and management. Whereas, Eke, et al (2020) were of the opinion that adequate funding is highly essential for effective maintenance practices, even though Ani (2020) was of the view that grant towards maintenance of building facilities is on its lowest, due to the fact that most buildings are often neglected by subsequent tenures of government.

Therefore, the attitude of the management towards maintenance of public buildings demands serious attention, and the maintenance work can be minimized by good design and proper workmanship carried out by skilled experts or competent craftsmen using suitable codes of installation, requisite building materials and methods, and management of any process involves assessing performance, and maintenance management of the buildings will be to a very absolute extent (Turrell, 1997, cited in Adenuga, Odusami and Faremi, 2007; Bryan, 2018). This is because; managers are the people responsible for the conduct and control of such an undertaking (Adenuga, 2012). The job of the managers is to organize all the government resources – men, machines, material and money into useful enterprises (iProject, 2020).

Definition of Key Terms

Building Maintenance

The BS 3811 (1984) defined maintenance as the combination of all technical and associated actions intended to retain an item or restore it to a state in which it can perform its required function. The Oxford Advanced Learner's Dictionary (2005) in its context defined maintenance as the act of keeping something in good condition by checking or repairing it regularly. Whereas, Chitkara (2008) sees maintenance, amongst other things, as a multidimensional interaction of dynamic forces represented by its time, resources constraints, maintenance costs and how to stay within the maintenance budget.

Type of Maintenance

Maintenance, according to BS 3811 (1984), is subdivided into planned and unplanned maintenance. While planned maintenance is regarded as preventive maintenance, corrective maintenance, predictable maintenance and schedule maintenance, unplanned maintenance is unpredictable maintenance, avoidable maintenance and emergency maintenance.

Public Buildings

Public buildings, according to Lexico (2021) are buildings used for any purposes, such as assembly education, entertainments or worship. They are non-movable facilities like residential buildings, offices, schools, post-office, stadium, recreation and event centers, etc, that cannot change their locations; and are owned or being monitored by government either at federal, state or local government level. (Iwaere and Lawal, 2011). Some of the examples of public buildings are: educational buildings, railway stations, hospitals, public gardens, government offices, police stations, etc (Quora, 2021).

Maintenance Management

While Kumar (2022) opined that Maintenance management is an orderly and systematic approach of administrative, financial, and technical framework for assessing, planning, organizing, monitoring and evaluating maintenance operation activities and their cost on continual basis, maintenance management is a critical part of the overall maintenance of the structure organization. It is defined as the coordination of maintenance task to manage the maintenance of structural assets of an organization, in order to preserve a safe, habitable, conferrable, and functional structure at all times (FTMaintenance, 2022).

The Essence of Maintenance

The primary objective of building maintenance, according to FTMaintenance (2022) is to preserve buildings in their initial functional, structural and aesthetic states. This is to ensure that such facilities continues to remain in such state and retain their investment value over a long period of existence, and provide safe and conducive environment for the performance of various human activities (Baba &Buba, 2014), and enjoy the best value for its money (Ajibola,

2009). Yet, Odediran, Opatunji and Eghnure (2012) were of the opinion that maintenance attitude remains low at individual and government level. Maintenance culture in Nigeria is one of the lowest around the world, especially, in our principal towns and cities where the majority of public properties are located. The variables are structural components condition, roof components, toilet facilities, discharge of waste water component, exterior wall condition, condition of walkway within the building premises, electrical wire and switches conditions and interior walls surface condition (Olagunju, 2012). It is expedient that maintenance should remain a priority by the managers, so as to preserve the building in its original shape and standard in terms of structural stability to meet the current taste and demand, attract higher rental value, assist in the minimization of production cost that will keep down time and maintenance costs to a minimum level, maintain and retain aesthetic value as well as to improve the general condition of such buildings (Al-Zabaidi, 1997).

Factors Influencing Building Maintenance Generally

Some of the factors influencing building maintenance are that certain buildings in Nigerian cities were constructed during the pre-colonial era. Therefore, most of these buildings are aged, due to wear and tear, weathering and climatic factors over the years, thus resulting in dilapidated nature, which might not respond positively to modern day maintenance (Ani 2020**;** Nairaproject.com, 2017; Mbamali 2003;Olanrewaju&Anifowose, 2015). Amobi (2003) submitted that such might have stemmed from building decay as a result of poor workmanship and poor supervision. Iyagba (2003), cited in Adenuga, Odusanmi&Faremi (2007) opined that such influence might be due to bad design, improper workmanship carried out by unskilled experts or competent craftsmen using unsuitable codes of installation, bad building materials and methods. While Olagunju (2012) submitted that some of the factors can include, building's state of repair, building type and owners/occupiers highest level of education.

While Chitkara (2008) and Asiabaka (2020) posited that for maintenance managers to effectively administer their jobs, the available resources must be planned, organized, coordinated, monitored and controlled. Yet, Ogunmakinde, Akinola and Siyanbola (2013) identified non-availability of funds, indiscipline and ignorance, bad economy, corruption (Ani, 2020), cultural beliefs, lack of maintenance culture, lack of skilled maintenance personnel, use of foreign building materials and unethical behaviour as some of the factors responsible for poor maintenance work. Abiodun (1996), cited in Waziri and Vanduhe (2013), observed that lucrative building maintenance contracts are awarded without due process, which also contributes to poor maintenance of buildings.

Asiabaka (2020) and Oladapo (2004), cited in Akinsola, Hussani, Oyenuga and Fatokun (2012) submitted that the problem of fund and underfunding for maintenance has been the order of the day for managers in all organizations. Also, users do not always make use of the property and the services in good condition. Often, users do not obey the information contained in the maintenance manual of the building, if at all it exists.

2.0 Methodology

The Study Area

The study area is Akure, the capital city of Ondo State, Nigeria and one of the most important cities in Nigeria, located in southwestern part of the country (7°15′0″N; 5°11′42″E) (Akure Map, 2014). It occupies a land area of 318.00 square meters and has a population of 360,268 with the population density of 1,132.92 (NPC, 2006; Ondo State, 2010)**.** Despite being one of the most densely populated cities of the country, Akure does not lag behind in terms of development, because of the economic and commercial profile it drives.

The Akure city connects to certain other Nigerian states/cities such as Ibadan, Lagos, Benin, Port Harcourt, Ekiti State, Osun State, Ogun State, Abuja, etc. According to Akure Oloyemekun (2014), there are many public educational institutions and learning centers, with many government offices, agencies and parastatals with their various government reserved areas/accommodations, with recreation and relaxation centers; both at local, state and federal government levels.

Material and Methods

This study is descriptive, andthe research work was obtained through the use of structured questionnaires from the users of government

public building facilities; technical staff in some of the government ministries, parastatals and agencies as well as professionals in the building industry. Questionnaire survey was found effective because of the relative ease of obtaining appropriate data for achieving the study objectives. Seventy-seven (77) questionnaire were retrieved out of one hundred and ten (110) structured questionnaires distributed which comprised two sections. Section A captures the demographic profile of the respondents and section B consists of eleven (11) relevant factors influencing the maintenance culture of public buildings, fourteen (14) factors influencing management decision to prompt and effective maintenance of public buildings in Ondo State, Nigeria, and the solutions to management decision to prompt and effective maintenance of public buildings in Nigeria, which were summarized from the basis of related research works, together with revision and modifications by experts.

The result of the research work was computed through the use of statistical package for social sciences (SPSS17) using frequencies, percentages and Relative Importance Index (RII) = ∑W/(A X N), (0 ≤ index ≤ 1)on a likert scale of 1-4 based on their significancesimilar to the one used by Baloyi and Bekker (2011), as cited in Ebekozien, Uwadia and Usman,(2015); Vanduhe (2012), cited in Waziri and Vanduhe (2013); Olanrewaju and Anifowose (2015). Respondents were asked to score factors affecting public buildings according to the degree of importance; where 1 = most unlikely; 2 = unlikely; 3 = likely; 4= most likely. The relative importance index (RII) is given by equation (1)

$$\text{Relative importance index} = \frac{\sum w}{AN}$$

Where **W** is the weighting given to each factor by the respondents, ranging from 1 to 4, **A** is the highest weight (i.e. 4 in the study) and N is the total number of samples **(that is 77 in thiscase)**. The rating of all the factors for degree of significance was based on the value of their Respective Importance Index **(RII).** The guide for the rating is given in Table 1

Table 1: Guide to degree of significance

S/N	Degree of significant	Rating
1	Most significant	0.76 above
2	Significant	0.67-0.75
3	Less significant	0.50-0.66
4	Not significant	0.49 below

Source: Vanduhe (2012) cited in Waziri and Vanduhe (2013)

Data Analysis

The problem of maintenance in public buildings and its management in order to bring about sustainability has suffered from lack of funds and other factors for a considerable time (Baba &Buba, 2013; Tonnie, 2020), and has remained a re-occurring decimal, particularly in Nigeria. This is because Ajibola (2009) saw maintenance as the work that is supposed to be done regularly to keep a building in good condition, and as near as possible in their original state, and that the management should always be seen as the dynamic link for such maintenance in its essence of time constraints, resources and how to stay within the maintenance budget (Chitkara, 2008). This is as it has affected Akure city; the State Capital of Ondo State, Nigeria, as indicated in the findings of this study.

3. Results and Discussion

Results

Table 2: The number of questionnaire retrieved from the different organizations that made up the population

Table 2: Questionnaire Distribution and Retrieval

Number Distribution	Number Retrieved	Rate of Return (%)
110	77	70.00

Table 3 shows the demographic variations of years of experience of the respondents. While the category that falls within 21 years and above of experience had 37.66%, the category of 11 and 20 years had 29.38%. The respondents that fall within 6 and 10 years had 23.38%, and the

last category that falls between 1 and 5 years of experience were 9.09%.

Table 3: Years of Experience of Respondents in Maintenance Management of Public Buildings

Categories	Frequency	%
21 and Above	29	37.66
11 – 20	23	29.87
6 – 10	18	23.38
1 – 5	7	9.09
Total	**77**	**100.00**

Table 4 shows the educational qualification of the respondents. High School/Trade Test has 29.87%, BSc has 16.88%, HND has 19.48%, PGD has 14.29%, ND has 9.09%, M.Sc has 6.49% followed by Ph.D., which has 3.90%.

Table 4: Highest Qualification of Respondents

Categories	Frequency	%
High School/Trade Test	23	29.87
ND	7	9.09
HND	15	19.48
B.Sc	13	16.88
PGD	11	14.29
M.Sc	5	6.49
P.Hd	3	3.90
Total	**77**	**100.00**

Table 5 shows the category of the professional status of the respondents in their preferences. The Quantity Surveyors were 22.08%, the Non Professional (Artisans) were 18.18%, Architects were 14.29%, Engineers were12.09%, Building Technologists were 11.69%. Other Staff in the Maintenance Unit were 9.09%, Contractors were 6.49, and the Clients were 5.19%.

Table 5: Highest Professional Status of Respondents

Categories	Frequency	%
Non Professional Status (Artisan)	14	18.18
Architects	11	14.29
Engineers	10	12.99
Quantity Surveyors	17	22.08
Building Technologists	9	11.69
Contractors	5	6.49
Other Staff in the Maintenance Unit	7	9.09
Clients	4	5.19
Total	**77**	**100.00**

Table 6: Respondents' Ranking of the Key Factors Influencing Maintenance in Public Buildings. Based on scale 1-4, where 4=most likely 3=likely, 2- unlikely, 1=most unlikely

Factors	RII	Rank
Design and construction defects/errors	0.87	**1st**
Poor workmanship	0.85	**2nd**
Age factors due to wear and tear	0.84	**3rd**
Corruption	0.83	**4th**
Occupants' style of use	0.81	**5th**
Lack of quality control factors and Post construction prevention mechanism	0.77	**6th**
Dilapidation factors	0.75	**7th**
Vandalism	0.73	**8th**
Force Majeure	0.71	**9th**

Occupiers level of education/information about maintenance	0.69	**10th**
Specifications defects	0.67	**11th**
Consultants firms administrative style	0.66	**12th**
Weather/Climatic factors	0.65	**13th**

Table 7: Respondents Ranking of FactorsInfluencing Management Decision to Prompt and Effective Maintenance of Public Buildings.

Identified Causes	RII	Rank
Status of the building	0.83	1st
Age of the building	0.82	2nd
Availability of fund	0.81	3rd
Political factors/influence	0.80	4th
Prompt release of fund even when available	0.79	5th
Preferential treatment	0.76	6th
User's persistence to complaints	0.73	7th
Approval protocol causing delay in response to complaints	0.71	8th
Corruption	0.69	9th
The users status	0.63	10th
Building complexity	0.59	11th
Availability of building materials	0.53	12th
The wiliness of the users to foot the maintenance bill for later refund	0.49	13th
Building location	0.45	14th

Table 8: Respondents Ranking of Solutions to Management Decision to Prompt and Effective Maintenance of Public Buildings in Nigeria.

S/N	Identified Solutions	RII	Rank
1	Strict compliance to the usage of good materials at construction and maintenance time	0.89	1st
2	Maintenance Management culture must be made a priority by the stakeholders at all levels.	0.86	2nd
3	Capacity building in public maintenance management agency through private partnership involvement for quality delivery	0.84	3rd
4	Availability of fund	0.81	4th
5	Strict compliance to maintenance management model.	0.79	5th
6	Award of maintenance contract to qualified contactor without political interference	0.78	6th
7	Allocation of fund during budgetary provision.	0.76	7th
8	Consistency and continuity in the maintenance management policies of government programs at all levels.	0.75	8th
9	Adherence to proper planning and time consciousness	0.74	9th
10	Enforcement of monetary and cost control mechanism	0.70	10th
11	Willingness of the facility users to foot maintenance bill for later refund	0.53	11th

Discussion

Assessing the objectives was based on their RII placed on a likert scale of 1-4 to test the respondents' opinion of the provided variables. Table 6 above shows the respondents' ranking of the key factors influencing maintenance in public buildings. The first five (5) out of the thirteen (13) factors were: design and construction defects/errors (RII=0.87), poor workmanship (RII=0.85), age factors due to wear and tear (RII=0.84), corruption (RII=0.83) and occupants' style of use (RII=0.81).

Table 7 above shows the respondents' ranking of the key factors management decision to prompt and effective maintenance of public buildings in Akure city. . The first five (5) out of the fourteen (14) factors were: status of the building (RII=0.83); age of the building (RII=0.82)' availability of fund (RII=0.81);

political factors/influence (RII=0.80); and prompt release of fund, even when available (RII=0.79).

Table 8 above shows the respondents' ranking of solution to management decision to prompt and effective maintenance of public buildings in Nigeria. The first five (5) out of the eleven (11) factors were: strict compliance to the usage of good materials at construction and maintenance time (RII=0.89), maintenance management culture must be made a priority by the stakeholders at all levels (RII=0.86), capacity building in public maintenance management agency through private partnership involvement for quality delivery (RII=0.84); and availability of fund (RII=0.81) strict compliance to maintenance management model (RII=0.79).

4. Conclusion

The study concluded that design and construction defects/errors, poor workmanship, age factors due to wear and tear, corruption, occupants' style of use, lack of quality control factors and post-construction prevention mechanism, dilapidation factors, vandalism, force majeure and occupants' level of education/information about maintenance were major factors influencing maintenance in public buildings. Also, the key factors influencing management decision to prompt and effective maintenance of public buildings were status of the building, age of the building, availability of fund, political factors/influence and prompt release of fund even when available. Others are preferential treatment, users' persistent complaints, approval protocol, causing delay in response to complaints, corruption and building complexity.

The study, therefore, recommends that there should be strict compliance to the usage of good materials at construction and maintenance time. Maintenance management culture must be made a priority by the stakeholders at all levels and should be in strict compliance with maintenance management model. There should also be capacity building in the maintenance management agency, through the involvement of private partnership for quality delivery. There should be availability of fund that will quicken the solution, in consonance with proper planning and cost control mechanism towards prompt and effective maintenance of public buildings in Nigeria.

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