The International Journal Of Engineering And Science (IJES)
|| Volume || 4 || Issue || 8 || Pages || PP -01-06|| 2015 ||
ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805

The Challenges of Building Maintenance in Nigeria (A Case Study of Ekiti State)

Anifowose Ojo Segun, Olanrewaju Sharafadeen Babatunde Owolabi
Department of Building Technology,The Federal Polytechnic, Ado Ekiti, Ekiti State, Nigeria.
Department of Building Technology,The Federal Polytechnic, Ado Ekiti, Ekiti State, Nigeria.

ABSTRACT
This study examined the challenges of building maintenance in Nigeria. The study embarked on physical inspection of the facilities of some public and private buildings, identified defects in the buildings, determined the causes of the defect and proffered remedies for them. Data for the study were collected through well-structured questionnaire administered to building industryprofessionals. Data collected were analyzed using frequency distribution tables and relative significance index. The findings revealed that in the level of dilapidation of services in the facilities,kerosene cooking system ranked first (68% significance) followed by flush toilet (66%), while the pail system ranked least with (50%) significance. Considering the severity of defects in facilities, peeling of wall surface ranked first (50.8% significance)while foundation failure and sagging of beamswere ranked least with (42.8%). The causes of defects in the facilities were investigated and the use of untested or inferior materials (56.8%) was the most devastating factor. Availability of qualified and competent construction industry professionals was generally believed to be the most significant factor that would impact on the drive to achieve quality of maintenance operations in Nigeria.
Keywords: *Defects, facilities, dilapidation, building maintenance, building systems*

Date of Submission: 04 July 2015 Date of Accepted: 25 August 2015

I. Introduction

Most public and private buildings in Nigeria are faced with maintenance challenges resulting in deteriorations and ultimate defects of various degrees. While the [1] defined maintenance as the combination of all technical and associated administrative actions intended to retain an item in or restore it to a state in which it can be perform its required function, [2] defined building maintenance as work done to keep a building in, or restore it to its initial state, or to a currently acceptable standard.

To retain implies that defects are prevented from developing by carrying out work in anticipation of failure. To restore means that minor defects had already occurred before they are corrected. In order for an item or facility to continue to perform its required function, some degrees of improvement are needed over the life span of the building as standards of comfort and amenity arise where there are statutory requirements for maintenance. The acceptable standard must not be less than that necessary to meet them and the accepted standard must sustain the utility and value of the facility.

II. Literature Review

Sustainability of capital investments of any nation has been a major and global dialogue most especially in developing countries where infrastructural development is still at the infancy [3]. This is because most of government expenditures and investments focus on infrastructural development such as road, power, water and housing even though the challenges in the developed nations is sustainability. Most governments concentrate on the award of contracts for new infrastructures, giving near-to-nothing attention to the maintenance of existing ones. One of the ways for sustainability is the maintenance of the existing stock of infrastructural facilities and services. The level of dilapidation of facilities such askerosene cooking system, flush toilet, generator installation, well water , gas cooking system , bath facilities, in-house portable tap water, public portable tap water, private bath facility, public bath facility, electricity cooking system, spring and stream, pit latrine and pail system were identified by [3].

According to [2]: maintenance is the work or a combination of actions associated with initiation, organisation and implementation carried out to retain an item in or restore it to an acceptable standard in which it can perform its required function. Hence, [4] observed thedefects in housing facilities. He catalogue peeling of wall surface, rising dampness in substructure, floor slab failure and doors and windows defect, leaking roof while foundation failure and Sagging of beam. He further advocated that maintenance culture requires the

correct diagnosis of defects, current remedial measures, sound technical knowledge of material usage, management resources as well as the formulation and implementation of integrated planning and policies to sustain utility. The absence of these qualities has led to the decay of the nation's physical, social, aesthetic and economic environment. [5] ascertained the causes of defects in housing facilities to include theusing of untested or inferior materials such as cement, aggregate and water, improper management of the facilities such as door lock and louvers, lack of regular check-up of the facilities, improperly design of fire suppression system, causing un-insulated (PVC) pipes to freeze and burst and lack of qualified professionals.
[5]further stated that the emphasis was on the development of new properties with little attention paid to the maintenance of the existing stock and the future maintenance needs of the proposed ones. The general belief now is that the present very prohibitive cost of new buildings has imposed on individuals, corporate bodies and the nation as a whole the need to invest more in maintenance.

Housing maintenance becomes more difficult according to the age of the structure and this depends on the quality of the original building coupled with the rate of maintenance of the structure [6].Maintenance of the building received little attention from the users, designers and contractors [7]. It should be noted that the maintenance objective is to preserve buildings in their initial functional, structural and aesthetic states. This is to ensure that they continue to remain in such state and retain their investment value over a long period of existence [5]. The 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 it exists at all [7]. Most property owners sometimes endeavour to keep maintenance expenditure to the least, eliminating the consequences of the long term effect of such action. On the part of the designers, they may forget the durability of the materials and its serviceability before including them in their designs [8].

[4] identified some solutions to the identified defects such asavailability of qualified and competent artisan, taking good care of the building facility such as door locks, examining of building materials before use, regular check-up of facility such as a water tank and using of tested materials.

III. Methodology

One hundred and fifty buildings were surveyed in detail various defects. Questionnaire was developed to sample professional opinions on the probable causes of identified defects and to proffer remedies to same. Sixty (60) questionnaires was distributed, fifty (50) were collected back for analysis. The statistical package for social sciences (SPSS) was used for the analysis.Percentage, mean, and relative significance index (RSI)was determined. The relative significance index ranking (RSI) was used for ranking of the factors studied. These methods had been used in construction research by authors such as, [9], [10], [11], [12], [13] among others.
The Likert scale involving rating on interval scale of 5 and 1 developed for application in social sciences and management researches for quantification of qualitative variables was used. "Extremely Important" (EI) were scored 5, "Very Important" (VI) were scored 4, "Somewhat Important" (SI) were scored 3, "Not very Important" (NVI) were scored 2 and "Not Important" (NI) were scored 1.[14]gave an equation that could be useful for determining the Relative Significance Index (RSI) in prevalence data as:

$$\mathbf{RSI} = \frac{\sum \mu}{AN}$$

Where μ is the weighting given to each factor by respondents;

A is the highest weight (i.e. 5 in this case);

N is the total number of respondents

But for this type of research work where a 5-point scale was used, the RSI shall be calculated via the equation:

$$\mathbf{RSI} = \frac{5a + 4b + 3c + 2d + 1e}{jN} \qquad (0 \leq \text{index} \leq 1)$$

Where: a = number of respondents ''extremely important and perfectly known'',

b = number of respondents ''very important and partially known''

c = number of respondents ''somewhat important and known''

d = number of respondents ''not very important and partially unknown''

e = number of respondents ‘‘not important and perfectly unknown’’

N = sample size = 50
j = number of response categories = 5

IV. Data Presentation and Analysis

The data were presented using tables for clarification and better interpretation. The analysis tools included both descriptive and inferential statistics.

4.1 Professions of the respondents

Table 1:Professions of the respondents

	Frequency	Percentage
Builders	15	30.0
Quantity Surveyors	8	16.0
Architects	9	18.0
Estate Surveyor and Managers	8	16.0
Engineers	10	20.0
Total	**50**	**100.0**

Table 1 showed respondents’ occupation. It showed that 30 percent are builders, 20 are engineers, 18 percent are architects, 16 percent are quantity surveyors and 16percent constitutes estate surveyors and valuers.

Table 2: Buildings surveyed

	Frequency	Percentage
Public	30	20.00
Residential	90	60.00
Commercial	20	13.33
Industrial	10	6.67
Total	**150**	**100.0**

Table 2 showed types of buildings surveyed 60 percent are residential, 20 percent are public, 13.33 percent are commercial while 6.67 percent are industrial buildings.

Table 3: No of facilities surveyed per Local Government Area

S/N	Local Government	Headquarters	Number of Building Surveyed	Percentage (%)	Rank
1.	Ado-Ekiti	Ado-Ekiti	34	22.67	1
2.	Ekiti East	Omuo Ekiti	7	4.67	5
3.	Ekiti South West	Ilawe Ekiti	6	4	6
4.	Ekiti West	Aramoko Ekiti	6	4	6
5.	EfonAlaaye	EfonAlaaye	8	5.33	4
6.	Emure	Emure Ekiti	6	4	6
7.	Gbonyin	Ode Ekiti	5	3.33	7
8.	Ido-Osi	Ido-Ekiti	10	6.67	3
9.	Ijero	Ijero Ekiti	8	5.33	4
10.	Ikere	Ikere Ekiti	15	10	2
11.	Ikole	Ikole Ekiti	7	4.67	5
12.	Ilejemeje	Iye Ekiti	6	4	6

13.	Irepodun/Ifelodun	Igede Ekiti	6	4	6
14.	Ise/Orun	Ise Ekiti	5	3.33	7
15.	Moba	Otun Ekiti	6	4	6
16.	Oye	Oye Ekiti	15	10	2
TOTAL			**150**	**100.00**	

Table 3 showed the numbers of facilities surveyed per Local Government Area of Ekiti state. Ado Ekiti Local Government ranked first with 22.67 percent, Ikere Ekiti and Oye Ekiti Local Government Areas were ranked second with 10 percent. The table showed the geographical spread of the research as every Local Government within the state was included in the sampling for study.

4.2 Inspection of some Public and Private Building

Table 4: Level of dilapidation of building systems

FACILITIES	1	2	3	4	5	TOTAL	TWV	RSI	RANK
In house portable tap water	5	9	25	7	4	50	146	0.584	7
Public portable tap water	0	18	21	9	2	50	145	0.580	8
Well water	4	13	12	13	8	50	158	0.632	4
Spring and stream	7	19	12	8	4	50	133	0.532	11
Bath facilities	2	9	24	12	3	50	155	0.620	6
Pit latrine	7	18	14	7	4	50	133	0.532	11
Pail system	11	13	17	8	1	50	125	0.500	12
Flush toilet	3	6	19	17	5	50	165	0.660	2
Private bath facility	5	10	29	4	2	50	138	0.552	9
Public bath facility	6	15	19	5	5	50	138	0.552	9
Generator installation	1	11	18	18	2	50	159	0.636	3
Electricity cooking system	3	14	26	7	0	50	137	0.548	10
Gas cooking system	4	9	19	13	5	50	156	0.624	5
Kerosene cooking system	1	8	20	13	8	50	169	0.680	1

Table 4 showed the relative significance index (RSI) of the level of dilapidation of building systems. The kerosene cooking system is the most abused and it ranked first with an RSI value of 0.68, flush toilet ranked second with RSI value of 0.66 and generator installation ranked third with an RSI value of 0.636. These are followed by well water (0.632). They made significant contributions to the conditions of the buildings thus observed.

4.3 Identification of defects

Table 5: Identified defects

DEFECT	1	2	3	4	5	TOTAL	TWV	RSI	RANK
Foundation failure	16	17	12	4	1	50	107	0.428	5
Rising dampness in substructure	8	24	7	6	5	50	126	0.504	2
Floor slab failure	7	27	10	3	3	50	118	0.472	3
Leaking roof	14	15	15	2	4	50	117	0.468	4
Door and window defect	9	24	9	6	2	50	118	0.472	3
Peeling of wall surface	12	16	12	3	7	50	127	0.508	1
Sagging of beam	13	24	8	3	2	50	107	0.428	5

Table 5 showed the defects in facilities in the study area. The commonest defect was the peeling of the wall surface as corroborated by the respondents. This defect was ranked first with an RSI value of 0.508.Rising dampness from the substructure ranked second with an RSI value of 0.504, Floor slab failure and Door and window defect ranked third with an RSI value of 0.472.

4.4 Determination of the causes of defects

Table 6: Causes of defects

CAUSES	1	2	3	4	5	TOTAL	TWV	RSI	RANK
Lack of qualified Professionals	8	16	16	8	2	50	130	0.520	5
Improper design of fire suppression system, causing un-insulated (PVC) pipes to freeze and burst	5	20	14	10	1	50	132	0.528	4
Lack of regular check-up of the facilities	7	17	11	13	2	50	136	0.544	3
Improper management of the facilities such as door lock and louvers	3	23	11	8	5	50	139	0.556	2
Using of untested or inferior materials such as cement, aggregate and water	7	16	12	8	7	50	142	0.568	1

Table 6 showed the causes of defects in facilities in the study area. The use of untested or inferior materials such as cement, aggregate and water was generally believed to be the most significant factor responsible for the observed defects. Improper management of the facilities such as door lock and louvers ranked second with an RSI value of 0.556.

4.5 Suggested remedies for the identified defects

Table 7: Suggested remediesfor the identified defects

REMEDY	1	2	3	4	5	TOTAL	TWV	RSI	RANK
Using of tested materials	1	11	16	14	8	50	167	0.668	5
Regular check-up of facility such as water tank	2	4	23	13	8	50	171	0.684	4
Taking good care of the building facility such as door lock e.t.c	1	4	22	12	11	50	178	0.712	2
Involvement of qualified and competent professionals in the management of building production process	0	7	18	12	13	50	181	0.724	1
Examining of building materials before use	2	7	19	10	12	50	173	0.692	3

Table 7 suggested remedies for the identified defects. Among all the considered factors, the involvement of qualified and competentprofessionals in the management of building production processranked first with an RSI value of 0.724. Proper handling of accessories in the building facility such as door lock e.t.c ranked second with an RSI value of 0.712.

4.6 Discussion of findings

The buildings consist of systems. Fourteen systems were identified in the sampled buildings in the state. The system posing the most devastating danger was the kerosene cooking system with an RSI of 0.68. The combustion effect of this system caused defacement of walls and the finishes. This is particularly noticeable in the residential buildings around the kitchen areas. A total of one hundred and fifty (150) buildings, spread across the sixteen (16) Local Government Areas of the state were surveyed. Seven (7) major defects were identified. However, the peeling and the spalling of the wall surface was the commonest observed defect. The causes of these defects were also investigated. Many probable technical causes of the defects were examined. Among them, the use of untested or inferior materials for construction resulting in production outcomes that are below the specified standards was the most significant. Remedies were, thus, proposed in order to mitigate the challenges of inadequate maintenance. Though the use of untested materials is the worst causative factor for the occurrence of the observed defects, the research showed that most of the defects were preventable at the design and construction stages if qualified and competent professionals had been engaged early enough to handle the design and management of the building production processes. Quality specifications at the design stage and adherence to specifications at the production stage will result in building a structure with very low frequency of future maintenance.

V. Conclusion

Peeling of the wall surface of the sampled buildings, particularly, the residential ones were the most prevalent observed defect. A linkage could be established between the use of kerosene cooking system and the peeing defect because of intermittent heat and chemicals being generated as a result of the operation of the system. Untested or inferior materials were often being used in construction, resulting in substandard building production of that will require frequent maintenance to keep the as-built state. However, the involvement of construction industry professionals from the design stage through production stage could remedy most maintenance challenges associated with building facilities.

VI. Recommendations

The experience of the challenges of building maintenance in Nigeria over the years offered some lessons that can guide future policies. It has also assessed the checklist and alternative remedies of the approach of the targeted group in the face of some basic challenges.

The following recommendations are hereby made:

i. Construction industry professionals must be involved in all the stages of the design and construction processes.

ii. The materials to be used for construction must be tested and confirmed authentic.

iii. Competent and qualified artisans must involve in the construction and maintenance of building infrastructures.

REFERENCES

1] British Standard Institution, British Standard Glossary of Management Term in Terotechnology, BSI Hemel Hempstead, 1984

[2] British Standard Institution, BSI (1974): Glossary of General Term Used in Maintenance Organisation, BSI, London, 1974.

[3] E.S. Ojara,The Challenges of Housing Maintenance in Nigeria. Unpublished HND Project, Department of Building Technology, The Federal Polytechnic Ado Ekiti, Nigeria, 2013.

[4] S.U. Kunya, Maintenance Management Unpublished MTech Construction Management Lecture Notes. Building Programme, Faculty of Environmental Technology, Abubakar Tafawa Balewa University of Technology, Bauchi, Nigeria, 2012.

[5] O. Ipingbemi, Facility Management Unpublished Msc Housing Development and Management Lecture Notes. University of Ibadan, Nigeria, 2010.

[6] O.A. Adenuga, Building Maintenance in Nigeria: Structural Deterioration, Recognition Diagnosis of Causes and Remedies. (01):1999, 5-25

[7] A.B. Siyanbola, O.E. Ogunmakinde and A.A. Akinola, Analysis of the Factors Affecting Building Maintenance in Government Residential Estates in Akure, Ondo State, Nigeria, 2013.

[8] A. Adejimi,Poor Building Maintenance in Nigeria: Are Architects free from Blames? Being paper presented at the ENHR International conference on "Housing: New Challenges and Innovation in Tomorrow's Cities" in Iceland between 29th June-3rd July, 2005.

[9] T.M.S. Elhag, and A.H.Boussabaine, "Evaluation of Construction Costs and Time Attributes", *Proceedings of the 15th ARCOM Conference. Vol. 2*, (Liverpool John Moores University, 2, 1999)473-480, 15-17 September, 1999.

[10] O.O. Faniran,"The Role of Construction Project Planning in Improving Project Delivery in Developing Countries: Case Study of the Nigerian Construction Industry", *Proceedings of the 1st conference of CIB TG 29 on construction in Developing Countries: Construction Industry Development in the New Millenium*. The Pan Pacific, Sigapore. http:/buidnet.csir.co.za/cdcproc.docs/1st procedings.htm1#key, 1999

[11] A.B. Idrus, andJ.B. Newman, "Construction Related Factors Influencing Choice of Concrete Floor Systems", *Construction Management and Economics*, 20, 2002, 13-19.

[12] J. Kangwa, andF. Olubodun, "An investigation into Home Owner Maintenance Awareness, Management and Skill-Knowledge Enhancing Attributes", *Structural Survey, 21(2) 2003,.70-78*.

[13] A.A. Oladapo, "The Impact of ICT on Professional Practice in the Nigerian Construction Industry", *The Electronic Journal on Information Systems in Developing Countries*. 24, 2, 1-19 http://www.ejisdc.org., 2006

[14] N. Bakhary, "Arbitration in Malaysia Construction Industry" Retrieved 12th January, 2008 from http://www.efka.utm.my/thesis/images/4MASTER/2005/2JSBP/Part1/CHOOTZERCHING MA011138D03TT1.doc, 2005