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Investigation of Various Forms of Maintenance Problems Associated with Federal Housing Estate in Lagos State, Nigeria

By Akinola Victoria Olufunke & Akinola Joseph Aderemi

Federal University of Technology

Abstract- Maintenance facility in public buildings has increased rapidly among other business organizations, and thus aim to be one of leading factors in the world. Shelter has been universally accepted as the second important essential human needs after food. Housing in all ramifications is more than mere shelter as it embraces social services and utilities that make communities a livable environment. Efficient housing design is becoming imperative in urban centres; because it is an essential and fundamental component of the overall land activities in rural and urban areas. The aim of the study is to investigate various maintenance problems associated with Federal Housing Estate at AdeolaOdeku, in Lagos State. With a view to determining the effectiveness of maintenance strategies adopted and evolving good maintenance practices suitable for public estates in Nigeria. Data were obtained through reconnaissance, while surveys conducted on 6 blocks and occupiers were selected randomly.

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Investigation of Various Forms of Maintenance Problems Associated with Federal Housing Estate in Lagos State, Nigeria

Akinola Victoria Olufunke^α & Akinola Joseph Aderemi^ο

Abstract- Maintenance facility in public buildings has increased rapidly among other business organizations, and thus aim to be one of leading factors in the world. Shelter has been universally accepted as the second important essential human needs after food. Housing in all ramifications is more than mere shelter as it embraces social services and utilities that make communities a livable environment. Efficient housing design is becoming imperative in urban centres; because it is an essential and fundamental component of the overall land activities in rural and urban areas. The aim of the study is to investigate various maintenance problems associated with Federal Housing Estate at AdeolaOdeku, in Lagos State. With a view to determining the effectiveness of maintenance strategies adopted and evolving good maintenance practices suitable for public estates in Nigeria. Data were obtained through reconnaissance, while surveys conducted on 6 blocks and occupiers were selected randomly. A total of 90 questionnaires were distributed to the occupants, that is 15 questionnaires per block. Data collected were subjected to both descriptive and inferential statistical analyses using Statistical Package for Social Science (SPSS) version 17. Twenty factors were identified as the major maintenance problems associated with the Federal Housing Estate. Likert scale were used for collection of data while the results were analyzed using Mean Score and Standard Deviation. Findings revealed that leakages of pipes were rated first with mean value of 3.72, followed by faulty plumbing (3.64), elevator mechanical problems 3rd (3.40), windows/doors 4th (2.30), effect of leaking overflow 5th (2.07), settlement of concrete floor 6th (2.00) and bulging walls 7th (1.97) while electrical fittings, mechanical problems with A.C. and poor coordination of ventilation points were the least three problems with mean value of (1.39, 1.42 and 1.48). Thus maintenance strategies adopted are; corrective maintenance, planned preventive maintenance, condition-based maintenance, time-based maintenance. The research concluded that the effectiveness of maintenance strategies adopted in solving maintenance problems in the estate is excellence. The study recommended that housing project deserve to be cared for and preserved in order that its functionality and aesthetics will be better appreciated by the purpose it is designed and built for.

Keywords: maintenance facility, maintenance strategy, public buildings, housing projects, shelter.

Author α: Department of Building, School of Environmental Technology, Federal University of Technology, Akure.
e-mail: Olufunkhe_holla@yahoo.com

Author ο: Department of Quantity Surveying, School of Environmental Technology, Federal University of Technology, Akure.
e-mail: jaakinola@futa.edu.ng

I. INTRODUCTION

The lives of buildings are difficult to assess as all properties have, from the date of their erection, been the subject of varying amounts and standards of maintenance, besides being constructed to different standards. "Most buildings are constructed with the intention that they should last at least 60 years and many exceed this period" (Drake, 2008). Defects in the fabric of a building can result from "unrelated design decisions, unsuitable materials, incorrect assessment of loads, inadequate appreciation of conditions of use and inadequate assessment of exposure" (Cheetham, 2007).

According to James (2009), "there has been proliferation of contract forms, and much research work has taken place concerning the appropriateness of each for repair, maintenance and refurbishment work". "Maintenance units use a combination of in-house maintenance forces and private contract resources to perform their maintenance activities" (James, 2009). The appropriate maintenance outsourcing activities which should be contracted need to be determined. Some maintenance contractors may possess expertise that is not available within each unit. However, it requires additional expenses to administer maintenance outsourcing contracts, and this will need to be weighed against potential benefits.

Maintenance is a continuous operation to keep building, infrastructure, and equipment in the best form for use (Akasah *et al.*, 2009). It is also to ensure the facilities are in a good condition for a life time. In achieving the sustainability of facilities condition, maintenance management required the efficiency and effectiveness for strategic planning. Building Maintenance is the work undertaken in order to keep, restore or improve every facility, i.e. every part of a building, its services and surrounds to a currently acceptable standard, and to sustain the utility and value of the building (Mills, 2010). A more functional definition is that "Maintenance is synonymous with controlling the condition of a building so that its pattern lies within specified regions" (Shear, 2003).

The purpose of carrying out maintenance over property is to retain its values for investment, aesthetic, safety, durability, with a view to ensuring that the property is continually in good condition for habitation

and to the satisfaction of the owner(s)/users and communal prestige (Brennan, 2000). Housing maintenance becomes more difficult according to age of the structure and this depends on the quality of the original building coupled with the rate of maintenance of the structure (Adenuga, 1999). Maintenance of building received little attention from the users, designers and contractors (Ipingbemi, 2010).

However, most property owners sometimes keep maintenance expenditure to the least, eliminating the consequences of the long term effect of such action. On the part of the designers, they do not put into consideration durability of the materials and its serviceability before inclusion in the designs (Kunya, 2012).

The aim of this paper is to investigate maintenance problems associated with the Federal Housing Estate in AdeolaOdeku, Lagos State and strategies adopted for the maintenance of the Estate

II. LITERATURE REVIEW

a) Concept of Maintenance

Maintenance is primarily to preserve buildings in their initial functional, structural and aesthetic states so that they continue to remain as such and retain their investment value over a long period of existence. According to Drake (2008), it denotes all actions carried-out on a building after completion to preserve it in its initial state, starting from the defects liability period of the building to its disposal. With appropriate maintenance, the building's economic life is prolonged. However, a cursory look into some public buildings around reveals array of abandoned and epileptically functioning facilities. The malfunctioning of the facilities in most public buildings is a consequence of inadequate maintenance and/or poor management of the facilities.

BS 3811: explained that maintenance is the work or a combination of actions associated with initiation, organization 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, Kunya (2012) observed the defects in housing facilities and categorizes them as 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 plan and policies to sustain utility.

Housing maintenance becomes more difficult according to age of the structure and this depends on the quality of the original building coupled with the rate of maintenance of the structure (Adenuga, 1999). 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 (Ipingbemi, 2010). Most property owners sometimes endeavor 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 (Adejimi, 2005).

b) Maintenance problems associated with Housing

i. Common defects in building

Maintenance work is generated by ranges of factors. They include weathering, wear and tear, dirt, corrosion, structural and thermal movement, poor design, poor detailing, time, incorrect specification, damages by users, "insects, techniques and the use of new materials" (Brenan, 2000). Adenuga (2010) listed the factors below as major principal maintenance problems in buildings are:

1. Walls Problems such as Bulging walls, Cracking and spoiling concrete walls, inadequate foundation, tree rot damages, shrinkage/ swelling of clay subsoil, differential settlement, thermal movement, moisture expansion of block work, made up grounds, shrinkage of block work
2. Floor Problems such as Settlement of concrete floor, excessive deflection, sub-floor water, sulphate attack on concrete floor, screed cracking/hollow, collapse due to fungal or insect attacks, No damp proof membrane No sub flow access etc.
3. Doors/Windows Problems such as Insufficient groove, broken/cracked glass or frame, defective locks and keys, lose or twisted casements, rotten timber frames, defective putty or paint work
4. Damp Problems such as defective damp proof courses, damp basement walls, effect of leaking overflows or gutters, bridged damp proof courses, condensation on internal surfaces
5. Problem of Roofs such as Rotten battens, nails perishing, slate shipping, lack of insulating materials, sagging of timber, spread of structural roof, separation of structural elements, rot due to termite or beetle attack, perforated copper or zinc sheets, unventilated timber roof, insufficient parapet gutter, rusting of galvanized sheets
6. Wall Finishes such as flaking rendering Hollow rendering, cracking of rendering, spalling block work, Soft mortar, wrongly beaded stone work, disintegration of block work surfaces due to frost or salt action, surface deterioration of stone work.

c) Nature of Maintenance

Lee (2001) opined that nature of maintenance comprises of the following components.

i. *Repairs*

This is usually incorporated in a lease which attempts to indicate various standards such as substantial repair, good and tenantable repairs, good and substantial repairs. The word "repair" is adequate on its own and refers to the making of good, what is bad in buildings and their physical environment.

ii. *Renovation*

This consists of work done to restore a building, services and equipment by major overhaul to the original design or to improve on the original design. It could also include extensions and modifications. This could come in the form of a refurbishment which is the process of refitting an existing building to make it as good as new.

iii. *Rehabilitation*

This is an extensive work and modernization designed to upgrade a building to a modern standard, it also comes with rehabilitating the landscaped environment.

iv. *Replacement*

This inevitably occurs because of wear and tear on materials of components of a building as a result of usage. This decay or deterioration of materials and building components is usually seen in the frequent occurrence of breakdowns and offensive appearance. The frequency of replacement could often be reduced by the use of better quality materials, but the economics of this merit should be carefully studied. Replacement generally attributed to the intensity of the building components which eventually leads to the wear and tear of the building and subsequent breakdown of other facilities. Replacement as a term refers to the changing of the broken down or deteriorated building components with those component parts that are functional.

v. *Rectification*

This usually occurs in the early life of the housing. It is usually done to correct some shortcomings inherited from the initial design. It could involve the replacement of unsuitable parts of equipment or components which are faulty due to poor installation and incorrect assembly.

vi. *Servicing*

This essentially is a cleaning operation undertaken at frequent intervals. It usually deals with the prevention and ability to keep the equipment or property in a sound operating condition. It could be termed "day-to-day maintenance" as it involves day-to-day maintenance activities such as polishing, sweeping, painting of floors, doors, windows etc. It is also extended to services available within or outside the building.

d) *Maintenance Strategy*

Maintenance strategy is a systematic approach to upkeep the facilities and equipment and it varies from

facility to facility. It involves identification, researching and execution of many repairs, replace and inspect decisions and is concerned with formulating the best life plan for each unit of the building, in coordination with production and other functions concerned (Crepo and Gupta 2005). It describes what events (e.g. failure, passing of time, condition) trigger what type of maintenance action (inspection, repair or replacement). Thus, selecting the best sustainable maintenance strategy depends on several factors such as the goals of maintenance, the nature of the facility or the equipment to be maintained, work flow patterns (process focus, product focus) and the work environment (Adejimi, 2005; and Campbell, 2006).

Maintenance strategy consists of mix of maintenance policies and maintenance techniques which vary from facility to facility (Shear, 2006).

Basically there are various classifications of maintenance strategies as identified by different authors: Corrective Maintenance (CM), Preventive Maintenance (PM) and Predictive Maintenance (PM). Swanson (2001) in his study differentiates corrective maintenance (CM), planned maintenance (PM). Ipingbemi, (2010) consider each maintenance strategy as a separate strategy. Therefore, maintenance strategies are the methods of transforming business objectives into maintenance objectives. A maintenance plan can be developed by identifying the current potential gaps in maintenance performance (Crepo and Gupta, 2005).

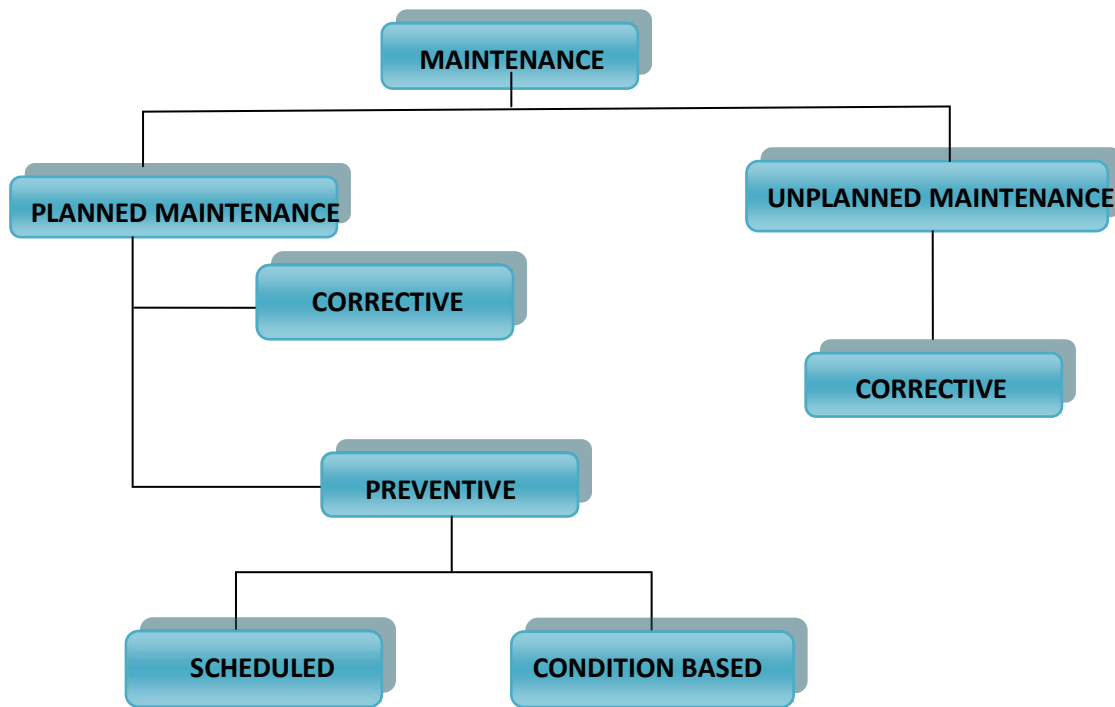


Figure 2.1: Classification of maintenance

Preventive maintenance has been described as "regular periodic work that may be necessary to retain the performance characteristics of a product as well as that required to replace or repair the product after it has achieved a useful life span" (Lee - Reginald, 2001). On the other hand, avoidable maintenance is work required to rectify failure caused by incorrect design, incorrect specification, insulation or the use of faulty materials.

e) Maintenance Strategy Formulation

The maintenance strategy requires to be supported by tactical plans. These tactical plans must be the executable plans (Campbell and Reyes-Picknell, 2006). Further, maintenance strategy needs to be reviewed periodically due to the changing environment and business requirements (Adejimi, 2005).

Therefore, the key points in formulation of maintenance strategy were identified by Drake, 2008 below:

1. Holistic approach is required to formulate maintenance strategy;
2. Structured development of maintenance strategy is must in almost every case; and
3. Apart from the structure maintenance strategy, flexible strategy is important so that it allows feedback, improvement and adjusts to changes in requirement of maintenance.

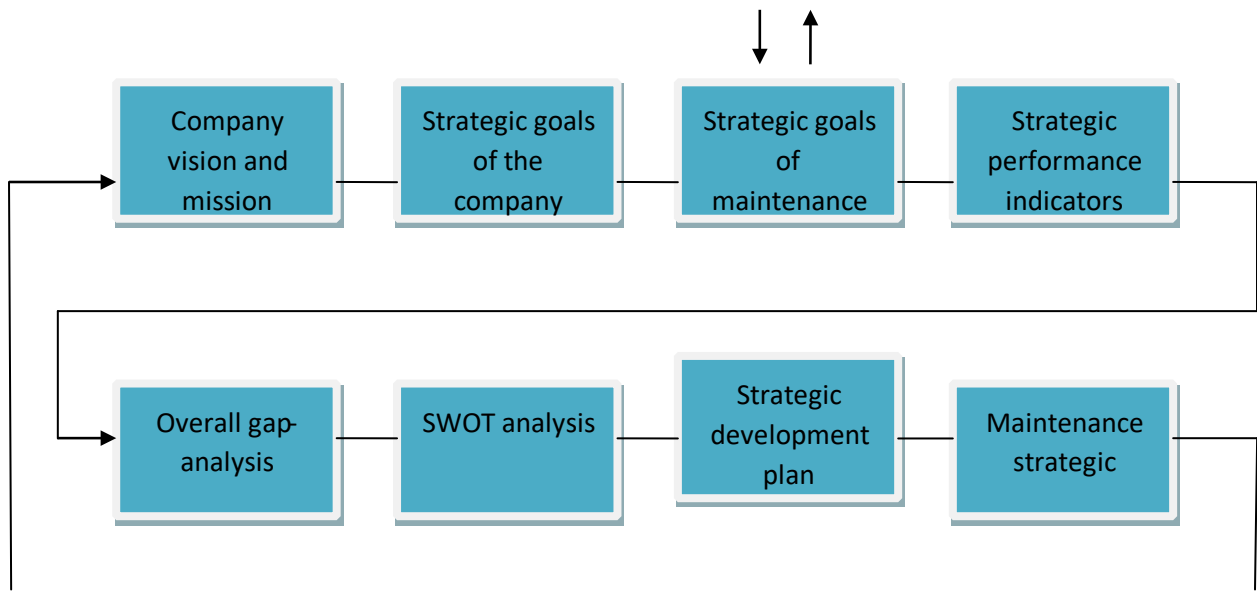


Figure 2.4: A schematic view of the work process when formulating a maintenance strategy

III. RESEARCH METHODOLOGY

The study adopted the use of both descriptive and inferential statistical tools, the descriptive statistics include the use of tables, pie chart, frequency, cumulative and percentage while inferential statistics entails mean scores, relative importance index and standard deviation. The research population comprises the occupants in the housing estate. The paper adopted

questionnaire survey on 15 occupants per block using five-point Likert's scale which is based on rating. A total of ninety (90) questionnaires were retrieved and analyzed. This represents a response rate of 100% which is above 20-30% recommended for questionnaire survey in Construction Management studies by Fellow and Liu (2008) using Statistical Package for Social Science (SPSS) version 17.

IV. DATA PRESENTATION AND ANALYSIS

Table 4.1: Background of Respondents

Category	Classification	Mid-Value	Frequency	F(x)
Years of occupants by Tenants	Below 2years	0	12	0
	2-4	3	23	69
	4-6	5.0	30	150
	6-8	7.0	15	105
	Above 8years	9.0	20	180
	Total	24		504
Mean=21				
Classification of occupation	Category	Frequency	Percentage	Cumulative
	Civil Servant	36	40	40
	Trader	12	13.3	53.3

	Self Employed	26	28.9	82.2
	Others	16	17.8	100
	Total	90	100	
Sex Distribution	Male	48	53.3	53.3
	Female	42	46.7	100
	Total	90	100	

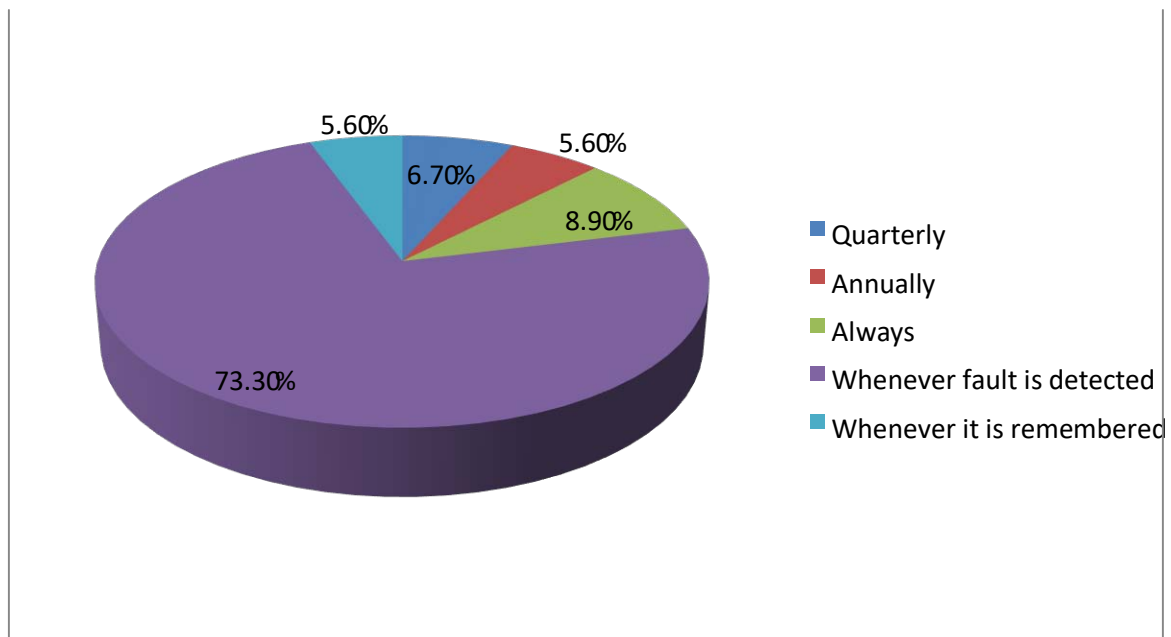


Figure 4.1: Maintenance Operation

Figure 4.1 shows that 6.7% of the respondents agreed that maintenance should be carried out quarterly, 5.6% agreed that it should be done annually, 8.9% said it is should be done always, 73.3% said it should done whenever there is fault and the remaining 5.6% said maintenance should be done whenever it is required.

Table 4.2: Various Maintenance Problems

Maintenance Problems	Mean	Std. Deviation	Ranking
leakages in pipes	3.22	.541	1
Faulty plumbing	3.14	.567	2
Elevator mechanical problems	3.00	.493	3
windows/doors	2.10	.854	4
effect of leaking overflows	2.06	.536	5
settlement of concrete floor	2.03	.636	6
bulging walls	1.92	.350	7

Damaged hose reel	1.55	.747	8
sub floor water	1.53	.585	9
swelling of walls	1.51	.792	10
cracking and spoiling concrete walls	1.51	.495	10
roof	1.40	.545	11
defective damp proof courses	1.39	.512	12
shrinkage of block work	1.39	.664	12
differential settlement	1.39	.593	12
fire hose	1.22	.572	13
Fire detectors and alarm	1.11	.782	14
Maintenance problems	Mean	Std. Deviation	Ranking
mechanical problems with a.c	1.09	.618	16
electrical fittings	1.02	.612	17

Table 4.2 shows various maintenance problems associated with the Federal housing estate AdeolaOdeku, Lagos state. The various maintenance problems were outlined and data were gotten from the respondents on the various major maintenance problems in the estate. The results showed that leakages of pipes were rated first with mean value of 3.72, followed by faulty plumbing (3.64), elevator mechanical problems 3rd (3.40), windows/doors 4th

(2.30), effect of leaking overflow 5th (2.07), settlement of concrete floor 6th (2.00) and bulging walls 7th (1.97) while electrical fittings, mechanical problems with A.C. and poor coordination of ventilation points were the least three problems with mean value of (1.39, 1.42 and 1.48).

Thus carrying out regular maintenance works on housing estate is essential as it will improve the strength of the building and the lives of occupant will not be at risk.

a) Strategies Adopted for Solving Maintenance Problems

Table 4.3: Strategy for solving Maintenance Problems

S/N	VARIABLES	CORRECTIVE MAINTENANCE	%	PLANNED PREVENTIVE MAINTENANCE	%	PREDICTIVE MAINTENANCE	%
1	SELDOMLY	12	13.33	14	15.56	43	47.78
2	OFTEN	17	18.89	31	34.44	31	34.44
3	VERY OFTEN	61	67.78	45	50	16	17.78
	TOTAL	90	100	90	100	90	100

Table 4.3, shows the strategy analysis for solving problems of maintenance, for corrective maintenance, 13.33 % respondents agreed to use corrective maintenance seldomly, while 18.89% agreed for often, 67.78% agreed that it should be used very often. Therefore, Corrective maintenance is used for the maintenance of the estate.

15.56% of the respondents agreed seldomly, 34.44% of the respondents agreed to often while 50% of used very often. Therefore, planned preventive is one of the strategies used in maintaining the estate.

47.78% of the respondents agreed that predictive maintenance is used seldomly, 34.44% of the respondents agreed to very often while 17.78% of the respondents agreed to very often.

V. CONCLUSION

Buildings deteriorate due to ageing, usage and adverse weather condition. For buildings to be habitable, and withstand the test of time, it requires constant and proper maintenance. Maintenance culture is necessary to keep the building in a good state. The

journey to effective and efficient strategy for maintenance of building project, for this research work depends on the reputation and resources. This research has given insight into information on the problems of maintenance in the estate and the appropriate maintenance strategy executed on the maintenance work in the estate. The critical survey carried out on the Federal housing estate AdeolaOdeku, Lagos in this work had resulted into giving useful and relevant information about public housing maintenance in Lagos State and Nigeria as a whole.

Practical suggestions towards solving the problems unravelled have proffered for implementation by the various sectors concerned. As a matter of fact the government is advised to include maintenance inside the budget and make it realistic so as to add value to. However, success in this direction requires dedication, commitment and deep sense of conviction on the part of those involved in the maintenance process.

The study recommended that the choice of execution of building maintenance work should depend on the one that offers greater advantage in terms of cost, quality and convenience, also Professional bodies should organize seminars and workshops to sensitize the staff on the use of effective maintenance culture while carrying out maintenance work thus Adequate funds should be made available always to carry out maintenance work on the estate buildings.

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