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From the top:

Arthur Pichler: People and Places (overall winner)

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# Assessment of Factors Affecting Maintenance Management of Public Hospital Buildings in Lagos State, Nigeria

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## ABSTRACT

The study focused on factors affecting maintenance management of public hospital buildings in Lagos state. It also assessed the operational state of public hospital buildings within the study area. In achieving these objectives, opinions of maintenance officers and users of selected public hospital buildings were sampled through structured questionnaires. The data collected were analyzed using descriptive and inferential statistics. The analysis revealed the operational state of public hospital buildings in Lagos State as been average, and there is no significant difference in the perception of the maintenance staff and the users as to the operational state. Maintenance officers and users of the buildings both ranked insufficiency of fund for maintenance programme as second most significant factor among other factors responsible for poor maintenance management of our public hospital buildings. Other factors found to be highly significant by the maintenance officers are; attitude of users and misuse of facilities, lack of discernible maintenance culture, inadequate training and reluctance of some establishment to support innovations. The users on their own perspective, ranked the inflation of cost of maintenance by the operatives, use of poor quality components and materials by the maintenance department and without long-term arrangements for the supply of essential parts for replacement as the most significant factor affecting maintenance management respectively. The study recommended proactive measures to reduce the occurrence of defects in the buildings elements and services. Governments are to provide adequate funding for the running of public hospitals and it should be a government policy that every hospital either public or private must have maintenance policy guiding the implementation of their maintenance programme. Building elements should be regularly inspected to ensure their functionality.

**Keywords: Hospital Building, Maintenance, Maintenance Management, Sick Building Syndrome, and Building Performance.**

## Introduction

Maintenance management in the public sector in Nigeria has suffered from lack of funds for a considerable time. While the requirements for good practice in maintenance management of building stock have been established over a considerable period, the achievement of good practice is by no means universal (Turrell, 1997). Maintenance of the built environment impacts on the whole nation. The conditions of the surroundings in which we live and learn, is a reflection of the nation's well being. (Lee, 1987). Maintainability of building has been identified as one of the key areas in which the construction industry must achieve significant improvement (Nayantharas de Silva et al, 2004).

According to Iyagba and Adenuga, (2003) it is impossible to produce buildings which are maintenance free, but 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. Management of any process involves assessing performance, and maintenance management of buildings is no exception (Turrell, 1997). In order for any maintenance manager to measure performance and set priorities, the organizational needs have to be considered i.e. the function and performance of buildings and their appropriate standards will be independent on the user's perception and their primary needs (Chanter and Swallow, 1996). Performance of hospital buildings and their component depends to a

large extent on continuous and planned periodical maintenance, which challenges owners and facility managers to institute precise planning based on a well-structured maintenance programmes (Shohet et al, 2002). Despite the ever-growing need for lower operational costs, facilities managers must ensure that facilities are constructed and maintained without compromising safety. In Nigeria, colonial architecture in some of the older public buildings especially hospitals which was hitherto famous for its sturdiness and functionality has now becomes less attractive because of the general neglect of the buildings. Overcrowding has also led to the deterioration of the facilities installed (Onifade 2003). If no action is taken all these old buildings and facilities will decay and will only be replaced in function if the means are available. The inadequacy of the operation and maintenance of building and infrastructure in developing countries has serious consequences for economic and social development especially on the health sector.

### **Statement of the problem**

Existing health sectors building in Nigeria lack adequate maintenance attention. Most public hospital buildings are in very poor and deplorable conditions of structural and decorative disrepair. While considerable of research have been carried out on factors responsible for the poor maintenance of public housing estates and offices in Nigeria but only scant attention has been given to the key parameters affecting the implementation of maintenance programmes for public hospital buildings. There is therefore a need to establish and evaluate the factor affecting maintenance management of public hospital buildings using appropriate analysis.

### **Aim**

To find out the factors affecting maintenance management in public hospital buildings in Lagos state with a view of providing solutions to them.

### **Objectives**

1. To assess the operational state (physical-functional condition) of public hospital buildings in Lagos state as carried out by the maintenance department.
2. To determine factors affecting maintenance management of public hospital buildings in Lagos state.

### **Research hypotheses**

- There is no significant difference in the perception of maintenance staff and users on the operational state of public hospital buildings in Lagos state.
- There is no significant association between the maintenance staff and users in response to factors responsible for poor maintenance management of public hospital buildings in Lagos state.

### **An Overview**

#### **The Maintenance of Public Hospital Buildings**

Today's government – operated public hospital is confronted by unique challenges that threaten its very existence (Stolzenberg, 2004). The characteristics and the structure of the public hospital, by their nature lack the capacity to compete in a market – driven economy. This deficiency is further found to originate in the institutions inherent government structure. This structure promotes inefficiencies and inflexibility, the imposition of bureaucratic impediments to operational effectiveness.

According to Shohet, (2003), the performance of hospital buildings and their components depends to a large degree on continuous and planned periodical maintenance.

Historically, in both public and the private sectors, maintenance is seen as an avoidable task which is perceived as adding little to the quality of the working environment, and expending scarce resources which would be better utilized (Higher Education Backlog Maintenance Review, 1998). In Nigeria, according to Iyagba and Adenuga, (2005), public buildings are in poor and deplorable conditions of structural and decorative disrepairs. In spite of millions of Naira spent to erect all these buildings, they are left as soon as commissioned to face premature but steady and rapid deterioration, decay and dilapidation.

The Built environment expresses in physical form the complex, social and economic factors, which give structure and life to a community (Lee, 1995).

According to Banful (2004) the financial consequences of neglecting maintenance is often not only seen in terms of reduced asset life and premature replacement but also in increased operating cost and waste of related and natural and financial resources. Maintenance is related to the background of any project, unfortunately development plans and approved recurrent and capital estimates in public hospitals in Nigeria have revealed that thought have not be given to maintenance work (Onifade, 2003).

## Methodology

This research covers public hospital buildings in Lagos State, Nigeria.

From the comprehensive list of public hospitals, a selection of ten (10) public hospitals was done using the random sampling method. The simple random sampling method was chosen so as to give equal chances to all the listed hospitals. Two categories of questionnaires were designed for this study and were directed to the maintenance staff and the users of these selected public hospital buildings respectively.

Hence, a total of sixteen (16) questionnaires were sent out to each of the ten selected public hospitals, out of which eight of the questionnaires were directed to the maintenance staff and eight questionnaires were directed to the users of each of the ten public hospital buildings respectively. Thus a total of one hundred and sixty (160) questionnaires were sent out to the ten selected public hospitals of which a total of a hundred (100) questionnaires were completed and used for the analysis.

## Method of data analysis

The data collected was analyzed using statistical package for social sciences (SPSS) so as to obtain a comprehensive and accurate analysis in both the descriptive statistics and inferential statistics as applicable.

## Analysis of data

Below are the analysis and the results of data collected from the field survey as extracted from the data collection instruments (Questionnaires A and B respectively).

**Table 1:** Number and rate of response by Maintenance Staff and Users.

Category	Questionnaires sent out	Responses	% of Response
Maintenance staff	80	50	63
Users	80	50	63
Total	160	100	63

**Table 2: Hospital name and address (Maintenance staff and users)**

Hospital name	Number of questionnaires sent out		Total questionnaires received
	Maintenance Staff	Users	
Lagos University Teaching Hospital, Idi Araba, Lagos.	8	8	10
Lagos Island Maternity Hospital, Lagos.	8	8	10
General Hospital, Lagos.	8	8	10
Psychiatric Hospital, Lagos.	8	8	10
Orthopaedic Hospital, Yaba, Lagos.	8	8	10
Lagos State Teaching Hospital, Ikeja, Lagos.	8	8	10
National Military Hospital, Yaba.	8	8	10
Gbagada General Hospital, Gbagada, Lagos.	8	8	10
Military Hospital, Ikoyi, Lagos.	8	8	10
Massey Children Hospital, Lagos	80	80	100
Total			

Source: Field survey 2006

**Table3: Positions of the maintenance staff in the maintenance department.**

Position in maintenance department	Frequency	Percentage
Senior Technical officer	4	8
Assistant Chief Engineer	1	2
Technical Officer	3	6
Principal Technical Officer	2	4
Chief Technical Officer	1	2
Chief Maintenance Officer	2	4
Head of Department	9	18
Works Officers	2	4
Chief Works Officers	2	4
Chief Electrical	2	4
Engineering Officer	2	4
Principal Work Support	8	16
Engineer	3	6
Manager	1	2
Head Technical Officer	2	4
Assistant Engineering Officer	2	4
Assistant Chief Technical Officer	2	4
Maintenance Officer	2	4
Missing	2	4
Total	50	100

Source: Field Survey 2006

Table 3 shows a breakdown of the positions of the respondents in the maintenance department. The analysis shows a fair representation across the ranks of maintenance personnel.

**Table4:** The departments of Users in the hospital.

Department	Frequency	Percentage
Management	19	38
Medical	19	38
Laboratory	5	10
Nursing	4	8
Parasitological	1	2
Bio Chemistry	2	4
Total	50	100

Source: Field Survey 2006

Table4 shows the breakdown of the departments of the users in the hospitals. This analysis shows a fair representation of the various departments of users in the hospitals.

**Table5:** Usage of the building (Maintenance staff).

Usage of the building	Frequency	Percentage
General	50	100
Anti-natal	0	0
Post-natal	0	0
Anti and Post natal special	0	0
Total	50	100

Source: Field Survey 2006

Table 5 shows that all the maintenance staff claims that the public hospital buildings are for general use.

**Table 6:** Usage of the building (users).

Usage of the building	Frequency	Percentage
General	43	86
Anti-natal	2	4
Post-natal	1	2
Anti and Post natal special	4	8
Total	50	100

Source: Field Survey 2006

Table 6 shows the breakdown of the use of the public hospital buildings as perceived by the users of which only 86% of the users claim that the hospital buildings are for general use.

**Table 7:** Length of service in maintenance department (Maintenance staff)

Duration	Frequency	Percentage
Less than 10 years	35	70
10-19 years	7	14
20-29 years	6	12
30 years and above	0	0
Missing	2	4
Total	50	100

Source: Field Survey 2006

In Table 7, the analysis reflects that 70% of the respondents have less than 10 years working experience while the remaining 30% of the respondents have more than 10 years working experience.

**Table 8:** Hospital working experience of respondent (Users)

Duration	Frequency	Percentage
Less than 2 years	2	4
2-5 years	9	18
5-10 years	34	68
10-15 years	5	10
Above 15 years	0	0
Total	50	100

Source: Field Survey 2006

In Table 8, the analysis shows that 86% of the respondents have working experience of between 2 years to 10 years.

**Table 9:** Approximate number of full time employees in the maintenance department (Maintenance staff).

Number of full time employees	Frequency	Percentage
1-10	0	0
11-30	19	38
31-60	22	44
61-100	5	10
101-500	0	0
Above 500	0	0
Missing	4	8
Total	50	100

Source: Field Survey 2006

Operational state of building elements and services as perceived by maintenance staff and the users of public hospitals buildings in Lagos State, using the scale; (1) Very bad (2) Bad (3) Average (4) Good (5) Very good

From the analysis, the following results were obtained;



The mean operational state of the structural elements (beams, columns, upper floor slabs and stairs) was found to be **3.47** hence; the operational state of the structural elements as perceived by both the maintenance staff and the users of public hospital buildings in Lagos State is **average**. The mean operational state of the walls (external and internal walls) was found to be **3.42** hence; the operational state of the walls as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **average**.

The mean operational state of the finishes (wall finishes, floor finishes and ceilings) was found to be **3.40** hence; the operational state of the finishes as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **average**.

The mean operational state of the windows was found to be **3.12** hence; the operational state of the windows as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **average**. The mean operational state of the doors (external and internal doors) was found to be **3.57** hence; the operational state of the doors as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **good**.

The mean operational state of the roofs was found to be **3.35** hence; the operational state of the roofs as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **average**. The mean operational state of the services (sanitary appliances, building service equipment, disposal installation, water, heating and ventilation, electrical, gas, lifts, protection installation, drainages, external services) was found to be **3.54** hence, the operational state of the services as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **good**. The mean operational state of the fittings and furniture was found to be **3.25** hence, the operational state of the fittings and furniture as perceived by both the maintenance staffs and the users of public hospital buildings in Lagos State is **average**. The mean operational state of sanitation of the environment was found to be **4.16** hence, the operational state of sanitation of the environment as perceived by both the maintenance staff and the user of public hospital buildings in Lagos State is **good**.

**Table 13:** The ranking of hypothesized factors responsible for poor maintenance management of public hospital buildings in Lagos state.

Hypothesized factors	Maintenance staff		Users	
	Mean score	Rank	Mean Score	Rank
Attitude of users and misuse of facilities	4.32	1	3.04	18
Insufficient funds for maintenance jobs	4.26	2	3.58	2
Difficulty in procurement of spare parts due to unavailable funds	3.76	3	2.88	21
Lack of discernable maintenance culture in the country	3.46	4	3.02	19
Inadequate training and development of personnel	3.44	5	3.00	20
Use of poor quality components and materials	3.38	6	3.56	3
The scale of efforts, extent of facilities and resources for maintenance operations on the quality of management in an organization	3.36	7	3.04	17
Persistent breakdown through indiscipline and ignorance	3.08	8	3.30	6
Absence of a form of planned maintenance programmes	3.06	9	3.08	15
Lack of successful maintenance programmes by the maintenance department	3.04	10	3.44	4
Lack of skilled personnel in maintenance department	3.00	11	3.18	11
Natural deterioration due to age and environment	2.98	12	2.84	22
No adoption of appropriate maintenance cycle for building maintenance	2.98	13	3.30	7

Lack of skilled manpower to maintain works in buildings designed and constructed by expatriates	2.78	14	3.22	10
No long-term arrangements made for the supply of essential parts for replacements	2.72	15	3.38	5
Complexity of design and non involvement of maintenance experts during design stage	2.64	16	3.16	13
Inadequate/inappropriate maintenance of facility plant and equipment for maintenance operations	2.56	17	3.30	8
Reluctance of some establishment to innovation support	2.50	18	3.14	14
No effective maintenance due to de-emphasize training, retraining and continuing education	2.42	19	3.26	9
Inflation of cost of maintenance by the operatives	2.22	20	3.74	1
Our level of technology, cultural background and environment not been considered	2.20	21	3.16	12
Frequent shortage of materials and spare parts due to absence of efficient inventory system	2.02	22	3.06	16

Source: Field Survey 2006

From the analysis, the maintenance staff and the users both agreed that insufficiency of fund for maintenance programme is a dominant factor among other factors responsible for poor maintenance management of public hospital buildings. The maintenance staff rated the attitude of users and misuse of facilities as the most significant factor responsible for poor maintenance management of public hospital buildings. On the contrary, the users, rated inflation of cost of maintenance by the operatives and the use of poor quality materials by the maintenance department as the most significant factor responsible for poor maintenance management of public hospital buildings.

#### Test of research hypotheses

$H_0$  = There is no significant difference in the perception of the maintenance staff and the users as to the operational state of public hospital buildings in Lagos State.

$H_1$  = There is significant difference in the perception of the maintenance staff and the Users as to the operational state of public hospital buildings in Lagos State.

From the computation for hypothesis 1, the significance value for the **t** test was found to be **0.06**.

**Decision:** since **0.06 > 0.05**  $H_0$  (null hypothesis) is accepted.

#### Test of hypothesis 2

$H_0$  = There is no significant association between the maintenance staff and users in response to factors responsible for poor maintenance management of public hospital buildings in Lagos State.

$H_1$  = There is significant association between the maintenance staff and users in Response to factors responsible for poor maintenance management of public hospital Buildings in Lagos State.

From the computation for hypothesis 2, the significance value for the **t** test was found to be **0.08**.

**Decision:** since **0.08 > 0.05**  $H_0$  is rejected. Hence,  $H_1$  (alternative hypothesis) is accepted.

#### Conclusion

The study has revealed that the operational state (physical-functional condition) of public hospital buildings in Lagos State as carried out by the maintenance department was found to be **average**, the mean is **3.48**. The analysis discloses that the public hospital buildings in Lagos State are in a mere state of existence in terms of the physical and functional conditions of the building elements and services that constitute these hospitals. For better performance, a proactive rather than reactive approach should be adopted for effective maintenance practices.

As for the factors responsible for poor maintenance management of public hospital buildings in Lagos State, quite a number of hypothesized factors were identified with the degree of the significance of each of these factors established as presented in the body of research work. Although, the two groups of respondents, the maintenance staff and the users respectively, did not agree on the degree of the significance of most of the hypothesized factors except for insufficiency of fund for maintenance works, which the two groups in their responses ranked to be the second most significant factor responsible for poor maintenance management of public hospital buildings in Lagos State. Lack of skilled personnel in the maintenance departments was also ranked as the median factor by both groups.

Although the study reveals that there is no significant difference in the perception of the maintenance staff and the users as to the operational state of public hospital buildings but there is no significant association between them in relation to factors responsible for poor maintenance management of public hospital buildings in Lagos State. The users, in their opinion attributed the cause to the maintenance department when the cost of maintenance is been inflated by the operatives, using poor materials and therefore producing a low quality work. The maintenance staff held to their views that the users' attitude and misuse of those facilities by them is strongly responsible for poor maintenance management of public hospital buildings.

### **Recommendation**

Public hospital buildings are places of healing as such more has to be done by both the maintenance management staff and the users to improve the operation state (physical-functional condition) above the average state as revealed by this research.

Maintenance managers and their team should adopt proactive approach to reduce the occurrence of defects, which will consequently bring about better physical and functional public hospital buildings elements and services.

Government should provide adequate fund for the running of public hospitals and private individuals and organizations should endeavor to assist government health related issues. Government should equally make it as a matter of policy for private and public hospitals that there should be a maintenance policy guiding their maintenance programmes. Maintenance managers should equally give the narrow managerial span of control a trial in use as this may likely bring about a more effective organizational structure leading to better maintenance management of public hospital buildings. It is also important that maintenance management work together with top administration management so as to secure sufficient funds for maintenance works as well as ensure that such funds is judiciously utilized.

Finally, maintenance management of public hospital buildings should ensure that the listed hypothesized factors are kept under check, as this will assist them in planning and executing maintenance programmes, as well as overcome the prevailing maintenance problems of public hospital buildings.

### **References**

Adenuga, O.A and Iyagba, R.O.A (2005) Strategic Approach to Maintenance Practices for Public Buildings in Lagos State, *Journal of Environmental Studies*, Faculty of Environmental Sciences, University of Lagos 5(1).

Anderson, E.S and Jessen, S.A (2000) Project Evaluation Scheme: A Tool for Evaluation Project Status and Predicting Project Results, *Project Management*, 6(1), 61 – 69.

Banful, E (2004) *A Stitch in Time Saves Nine; Cultivating a Maintenance Culture in Ghana*, An Article Presented at a Seminar on Maintenance Culture in Ghana. March 16, 1 – 2.

Chanter, B and Swallow, P (1996) *Building Maintenance Management*, Blackwell Scientific, Oxford, England.

- Colen, I.F and De Brito, J (2002) In Vral, O, Abrantes, V. and Taden, A. (eds). *Building Façade Maintenance Support System*, 3, 1899 – 1907.
- Crips, D.J (1984) Building Maintenance.... A Client's Viewpoint, *Managing Building Maintenance*, 23 – 35, CIOB: London.
- Hardy, O.B and Lammers, L.P (1996) *Hospital: The Planning and Design Process*, Aspen Publishers, Rockville.
- Iyagba, R.O.A (2005) *The Menace of Sick Buildings: A Challenge to all for its Prevention and Treatment*, An Inaugural Lecture Delivered at the University of Lagos. Pp 1 – 10.
- Jonassen, J. Klemanic, R and Leinenwe, M. (2001) Health Facility Flexibility and Humanity: An Agenda for the 21<sup>st</sup> Century, *Design Health. The Therapeutic Benefits of Design*, 257 – 275.
- Lee, R (1995) *Building Maintenance Management*, Blackwell Science Ltd, Oxford: UK.
- Oladapo, Y (2004) *Evaluation of the Maintenance Management of Staff Housing Estates of Selected First Generation Universities in Southwest Nigeria*, An Unpublished PhD Research Report in the Department of Building, Obafemi Awolowo University Ile-Ife.
- Onifade, K (2003) *Informatics in Hospital Management*, An unpublished MSC Research Report, Department of Business Administration, University of Lagos.
- Seely, I.H (1976) *Building Maintenance*, 5, Macmillan Press Ltd: London.
- Shohet, I.M (2003) *Key performance Indicators for Maintenance of Health Care Facilities* 21(1) 5-12.
- Shohet, I.M and Laufer, A (1991) Span of Control of Construction Foreman: Situation Analysis, *Journal of Construction Engineering and Management*, 117 (1), 90-105.
- Shohet, I.M and Perelstien, E (2004) Decision Support Model for the Allocation of Resources in Rehabilitation Projects, *Journal of Construction Engineering and Management* 130 (2), pp1-5.
- Smith. R (2003) Best Maintenance Practices; *Journal for Maintenance and Maintenance Management*, 16(1).
- Stolzenberg, E.A (1999) Governance Change for Public Hospitals, Fellowship Case Reports, American College of Healthcare Executives.  
<http://www.ache.org/membership/advtofellow/cascrips/governance99.cfm>
- Streifel, A.J (2002) *Infection Factors in Hospital Building Maintenance and Operations*, Department of Environmental Health and Safety, University of Minnesota.
- Turrell, P (1997) Small is Different: *A Strategy of Effective Management of Maintenance in Non-profit-making Organization*, The Royal Institution of Chartered Surveyors, pp 1-3.
- Ulrich, R (1992) *Garden in Health Care Facilities' Use*, *Therapeutic Environments Forum*, Academy of Architecture for Health, Hellmut, Obata.