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Evaluation of the maintenance level within the ambits of budgetary provisions in universities

Ndubuisi Michael Odoanyanwu [1, *], Calistus Chibuzor Okafor [1] and Ajuluchukwu Ebuka Igwe [2]

[1] Department of Architecture, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
[2] Department of Architecture, University of Nigeria, Enugu Campus, Enugu State, Nigeria.

Abstract

This research was therefore, aimed at evaluating the level of maintenance within the ambits of budgetary provisions in Universities. The methodology involved survey design, review of related literature, questionnaires, direct observations and interviews. The sample techniques involved both purposive and stratified random sampling applied on a population of 1300 staff, students and 84 buildings respectively. Data was analyzed using frequencies, percentages and mean scores. Pearson correlation coefficient, regression analysis and student t-test were employed in testing the hypotheses. Results revealed that maintenance of buildings in the institution is not effective. The research concluded that lack of building maintenance, funding and management decision play an important role in the physical condition of buildings which in turn affect staff productivity and students' academic achievement. The study recommends among others regular annual budgetary allocation to building maintenance; review the budgets from time to time to accommodate inflationary trends and early release of funds. Management should explore other ways and means of generating and sourcing funds for maintenance as a result of restrictions on government subsidies to institutions.

Keywords: Construction; Building; Maintenance; Budgetary; Regression; Correlations

1. Background to the Study

In Nigeria, according to Okolie [22] stakeholders have continuously expressed concern over the level of maintenance and suitability of educational buildings, especially in the universities. This concern provides the bases for this research. Studies carried out on maintenance of school buildings showed that maintenance fall below the level necessary to arrest deterioration [5, 9, 10, 17]. An assessment of our built environment in contemporary Nigeria shows that many publicly and privately owned buildings are in various states of disrepair, and dilapidation and consequently have become unsightly [1, 9, 10, 14].

In the light of the above, this research is focused on evaluation of maintenance activities and their impact on University Management in Universities. The focus is on holistic investigation of the physical conditions of the buildings in terms of components and elements. The study specifically identifies the deteriorating components, elements of buildings, as well as the causative factors. It also investigates how regular the buildings are inspected and maintained by the unit's in-charge of maintenance of buildings in the university. It further looked into budgetary provisions and administrative bottleneck if any in the maintenance of buildings in universities. Details of this have been discussed in subsequent section of this research.

[*] Corresponding author: Ndubuisi Michael Odoanyanwu; E-mail: mn.odoanyanwu@unizik.edu.ng
Department of Architecture, University of Nigeria, Enugu Campus, Enugu State, Nigeria.

1.1. Research Aim and Objectives

The aim of this research is to evaluate the building maintenance practices in Universities and their implications on the achievement of educational goal and objectives. This is with a view to developing effective and efficient maintenance management procedures to improve building maintenance in the institution. The specific objectives of the study include:

- To evaluate the level of maintenance within the ambits of budgetary provisions, in Universities.

1.2. Research Questions

The following research question formed the basis of this study:

What is the level of maintenance within the ambits of budgetary provisions in universities?

2. Introduction

2.1. Types of Maintenance

Maintenance may be executed through various types, depending on what to be maintained. Therefore, maintenance can be classified or subdivided: Akingbogungbe [3] records basic types of maintenance work as:

2.1.1. Exigency or Rectification Maintenance

This refers to maintenance needs, occasioned by sudden damage, blockage, faults, breakdown and other unforeseen needs in the building structure of facilities.

2.1.2. Preventive or Protection Maintenance

As the name implies, this bothers on maintenance work, carried out to forestall anticipated or likely failure in building structure or components. Example, are the repainting of metal components or wooden parts.

2.1.3. Redemptive Maintenance or Rehabilitations

This type of major maintenance covers a planned comprehensive maintenance, aimed at restoring the building structure to a currently acceptable standard or a purpose made standard.

However, in the context of this research, studies have shown that, maintenance may be categorized into the followings.

2.1.4. Preventive Maintenance

This is the type of maintenance carried out early at predetermined intervals in building structure or components, so that something bad does not happen, rather than trying to maintain it, after it has happened. As explained by this adage that 'prevention is better than cure', or a 'stitch in time saves nine'. Preventive maintenance for example, include regular and effective inspections of all building fabrics, clearing of septic tank, repainting, fumigation and pest control in buildings, replacement of leaking roofing materials.

2.1.5. Planned Maintenance

As the same suggests, it involves a set of decisions on how to carry out maintenance activities in the future. This type of maintenance can be achieved, based on the designers, manufacturers and suppliers' information known as manual or handbook. It is also known as a scheduled maintenance. Planned maintenance involves a planning programme which can be a short-term planning, and long-term planning.

2.1.6. Emerging Maintenance

This is the type of maintenance required to be carried out immediately without delay, because of an unexpected damage or failure of elements or components of a building, which if not maintained would results to further damage, resulting to total loss of the property. It usually arises mostly from eruptions, earth tremous, flood, wind storm and others.

2.1.7. Corrective Maintenance

A maintenance work carried out to restore a building to an acceptable standard as a result of failure or breakdown of a building or facility.

In another study, Chanter and Swallow [8] stated that for practical purposes, it is clear that the maintenance work level will consist of a mix of all these as shown in figure 1.

- Planned maintenance - maintenance organized and carried out with forethought, control and the use of records, to a predetermined plan.
- Unplanned maintenance - ad hoc maintenance carried out to no predetermined plan.
- Preventive Maintenance - maintenance carried out at predetermined intervals, or corresponding to prescribed criteria, and intended to reduce the probability of failure, or the performance degradation of an item.
- Corrective maintenance – maintenance carried out after a failure has occurred, and intended to restore an item to a state in which it can perform its required function.
- Emergency maintenance – maintenance that it is necessary to put in hand immediately to avoid serious consequences.
- Condition-based maintenance – preventive maintenance initiated as a result of knowledge of the condition of an item from routine or continuous monitoring.
- Scheduled maintenance: preventive maintenance carried out to a predetermined interval of time, number of operations, mileage
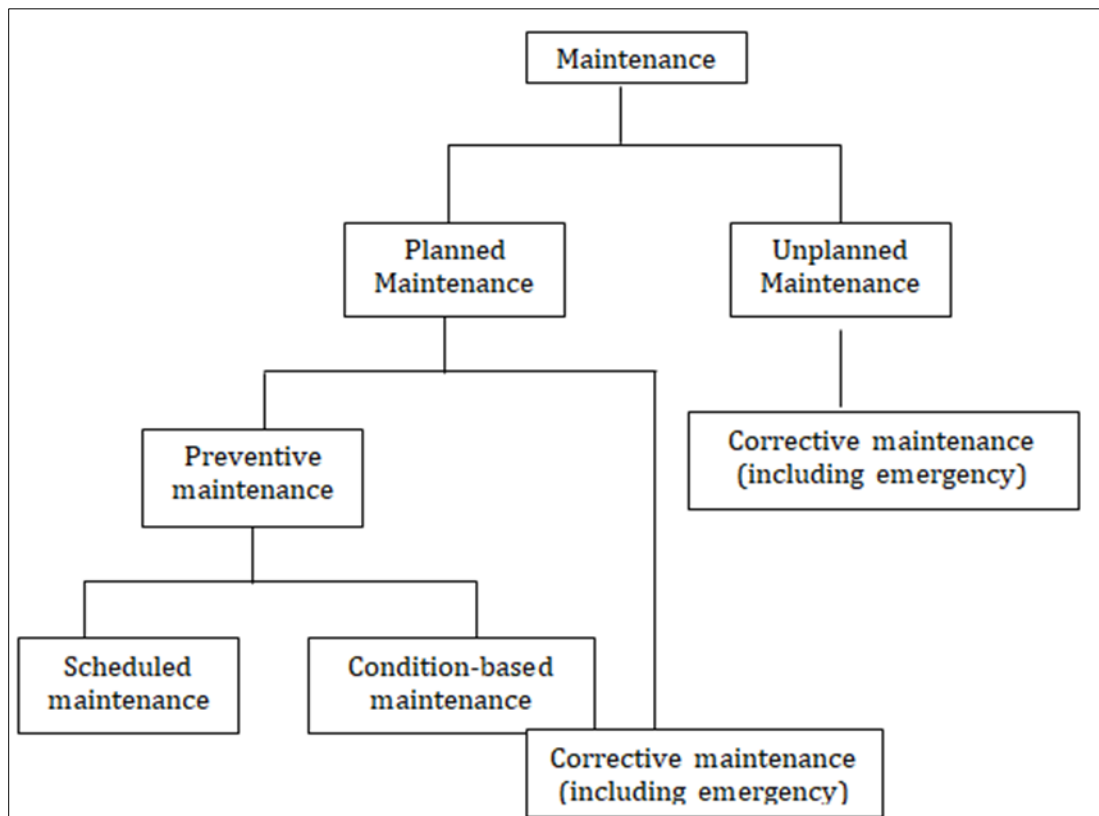

Figure 1 Types of Maintenance**; Source:** Ogunoh, [18]

2.2. Nature of Maintenance

According to Son and Yuen [26] maintenance of building covers many aspects of work which may be divided into four categories and thus:

- **First:** Planning, execution and cleaning of day-to-day maintenance which includes such activities as servicing and cleaning, and inspection of facilities and components. For example floors are usually swept daily and polished weekly, and painting done every 3 to 5 years.

- **Secondly:** Rectification work may be needed quite early in the life of the building because of design shortcoming, inherent faults in the use of materials or faulty construction. Those short comings often affect the performance of the component.
- **Thirdly:** There is the need to consider the replacement of costly items in building thus, the flat roof coverings to an apartment block may be relaid or air-conditioning system in a hosted may be replaced every 10 years.
- **Finally:** Maintenance may also embrace aspect of retrofitting or modernization. This sector of the market concerned with alteration, addition and enhancement to existing building on both small and large. Retrofitting work includes all work designed either to expand the capacity of a facilities or to enable the facility to perform some new function.

Obiegbu [15] equally observed that housing maintenance could take any of the following forms:

- **Decoration:** Painting and decorating, internal and external of building
- **Fabric:** The regular maintenance of the structure of building including foundation, walls (external and internal), floors, fittings and fixtures, internal finishes other structural items.
- **Service:** Plumbing and internal drainage, heating and ventilation, light and escalators, electric power and lighting, other mechanical and engineering services cleaning.

Consequently, building maintenance can also take the following:

- **Servicing:** This is to maintain and repair machinery or cleaning operation under taken at regular intervals of varying frequency. For example, floors of buildings are usually swept daily and polished weekly. Painting for decoration and protection can be done every 4 years or more.
- **Rectification:** Rectification means to put right or to correct a fault in a building as a result of poor design, faulty construction and damages of building materials and components in the transit. Typical examples include dampness in building walls as a result of wrong plumbing work. Wrongly done electrical wiring, painting failure of joint between slabs etc.
- **Replacement:** Due to the fact that service conditions cause materials and component of buildings to decay at different rates. Therefore, much replacement work arises from deterioration of appearance than from physical breakdown of materials of elements. For instance, a rusty corrugated iron roofing sheets coverings to a building may be replaced, peeled PVC floor tiles, broken window louver blades, door keys etc.
- **Renovation or Retrofitting:** This is to restore to good condition of existing building on both small and large scale. These include all work designed either/to expand the capacity of a facility or to enable the facility to perform some new functions and changing of old and absolute part of property to a more modern from. It is known as modernization. For example, some old existing residential building in our big towns are being converted to commercial buildings such as banks, hotels, office blocks. Furthermore, louver windows, jealously windows are being replaced with aluminum sliding windows and casement windows.

2.3. Execution of Building Maintenance Works

Maintenance work is an activity that involves numerous unpredictable and complex processes. Therefore, may require two methods or systems of execution and thus, direct labor and contracting out respectively. Obodoh [16] in his book titled, "Building Maintenance Handbook", advocates that the execution of maintenance work can either be done through direct labor or contract method. He maintains that the choice of method of execution depends on the one that offers greater advantage in terms of cost, quality and convenience. He further, points out that, some organizations use both methods, but they normally specify the amount and type of work which should be carried out either by direct labor or contract method. In a related development Ogunoh et al., and Ogunoh [17, 19], describes the two methods as:

- **Direct Labor:** A system or method whereby management uses in house resources such as labor and materials for execution of maintenance works. This according to him, means that management provides all materials and human resources for execution of maintenance work, and as such, is more economical than contracting out by at least the project margin, less supervision.
- **Contracting Out:** It is a system; organization selects a contractor who undertakes the execution and management of maintenance work. It is also describing as the process by which a user employs s separate organization under a contract, to perform a function, which could alternatively have been performed by direct labor or in house staff.

However, it was argued that direct labor is more economical than contracting out. That is why Akinsola and Iyagba [4, 12] point out, that direct labor has been predominantly used in execution of minor alternation, modification works

involving repairs, maintenance and refurbishment and some minor sub-contract trade works. But Opaluwah [25] is of a different opinion, when he says that the disadvantage of direct labor is over bloating the workforce and also distracting the organization from its core business [17, 18].

3. Research Methodology

The research methodology describes the procedures employed for gathering and generating the data needed for carrying out the research work and subsequent technique for processing and analyzing the collected data. According to Fellows and Liu [11] research methodology refers to the principles and procedures of logical thought process which are applied to a scientific investigation. Research methodology is the overall strategy, designed to achieve the aim and objective of the research [20, 21, 22, 23]. He maintains that, it includes the procedures and techniques of investigation for the effective and reliable representation of the research.

While research methods on the other hand, are merely tools used in gathering and analyzing data for the research [12, 20, 21, 22, 23]. Research method is described as the subset of the methodology, different research methodology. Thus, within a research methodology, different research methods or tools may be used to achieve the aim and objectives of the research [27].

3.1. Determination of Sample Size

The sample size for this study was determined using Bouely's formula as cited in Ogunoh et al., and Ogunoh [17, 19]

$$n = \frac{N}{1+N\,(e)^2}$$

when n = sample size, N = population, e^2 = Margin of error (assumed 5%), 1 = unity or constant

$$\text{Therefore} = \frac{1300}{1+1300\,(0.05)^2}$$

$$\frac{1300}{1+(1300x0.0025)} = \frac{1300}{1+3.25}$$

$$\frac{1300}{4.25} = 306$$

The sample size of 306 was adopted for this study.

Table 1 Distribution of Questionnaire

Group	Campuses	
	Total	**%**
Students	180	64
Works and service Department	30	11
Physical Planning Unit	19	7
Bursary Department	15	6
Academic Staff	36	12
Sub Total	280	100%

Source: Researcher's field study (2021)

3.2. Method of Data Analysis

The data generated for this study were analyzed with appropriate statistical techniques. The techniques included frequency, percentages and mean score. The hypotheses postulated were put in null (Ho). All analysis was done using Statistical Package for Social Science (SPSS) version 21. The hypotheses were tested as follows.

3.3. Presentation, Analysis and Interpretation of the Data Collected

The presentation, analysis and interpretation of all the data collected are presented and analyzed in this research.

Table 2 Level of Satisfaction on the Maintenance of Building

S/N	Level of satisfaction	No of Responses	Percentages (%) `
a	Strongly satisfied	-	-
b	Satisfied	60	33.33
c	Dissatisfied	70	38.89
d	Strongly dissatisfied	45	25.00
e	undecided	5	2.75
Total		180	100%

Source: Researcher field survey 2021

3.3.1. Respondents' Level of Satisfaction on the Maintenance of Building

The study sought opinion of respondents on the level of satisfaction of the maintenance of buildings. Table 2 shows that majority of 70 respondents representing 38.89% affirm that they are dissatisfied with the level of maintenance of buildings in their institution. But 60 respondents which represented 33.33% indicted that they are satisfied, 45 of them representing 25.00% said that they are strongly dissatisfied. While the minority of 5 respondents which represented 2.78% states, their opinion that they are unsure. This implies that the management of the institution should be more committed to maintenance, in order to enable students to enjoy the benefit of a planned modern environment and for the buildings to last long.

3.3.2. Hypothesis Two

The approach to funding of maintenance of buildings does not have significant relationship with the conventional sources of funds in educational institutions.

The essence of the hypothesis is to access whether the approach to funding of maintenance of buildings does have significant relationship with the conventional sources of funds in educational institution. Data used: Respondents opinion from questionnaires table 3 and 4, as well as relevant data from the study institution. The statistical tools used are Pearson correlation coefficient and regression analysis.

The Pearson correlation tool was used to assess the respondent's opinion that, the approaches to funding of maintenance of buildings do have significant relationship with the conversional sources of funds in educational institutions. While the regression analysis was used to develop a regression model which shows that the approaches to funding of maintenance of buildings do have significant relationship with the conversional sources in educational institutions.

The formula for Pearson Correlation Coefficient is given below as:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[(n\sum x^2 - (\sum x^2)(n\sum y^2 - (\sum y)^2)]}}$$

When y<+ 0.5, a weak positive relationship exists
When y ≥ + 0.5, a strong positive relationship exists
When y< - 0.5, a strong negative relationship exists
When y ≤ - 0.5, a weak negative relationship exists
When y = + 1, a perfect positive relationship exists
When y = - 1, a perfect negative relationship exists
When y = 0, no relationship exists.
While regression is expressed in a mathematical equation given as

$$Y = a + bx$$

Where, Y is the dependent variables or quantity being predicted

x = the independent variables

a = The value of Y when x = 0, i.e., the interceptor of the line with Y –axis

b = The slope or gradient. It estimates the rate of change in r for a unit change in x. it is positive for direct and negative for inverse relationships.

Table 3 Actual Amounts on Maintenance of Buildings between 1995 & 2021

A (Thousands ₦)	B (Thousands ₦)	C (Thousands ₦)
285	570	95
270	540	90
270	540	90
270	540	90
300	600	100
300	600	100
450	900	150
450	900	150
630	1260	210
1170	2340	390
1230	2460	410
1230	2460	410
1284.21	2568.42	428.07
1447.36	2894.71	482.45
1073.32	2146.64	357.77
387.86	775.72	129.29
404.62	809.23	134.87
2877.79	5755.57	959.26
6734.28	13468.56	2244.78
6940.16	13880.32	2313.39
8075.11	16150.22	2691.7
7518.82	15037.64	2506.57
1902.12	3804.23	634.04

Source: Researchers Field Survey, 2021; A = Internally Generated Revenue. (IGR), B = Federal Government Revenue, C = Donations
Correlation Analysis on Actual Amount on Maintenance of Buildings within 1995 – 2021

Table 4 Bivariate Correlation among the Various Sources of funding for Building Maintenance

		A	B	C
A	Pearson Correlation	1	1.000**	1.000**
	Sig. (2-tailed)		0.000	0.000
	N	23	23	23
B	Pearson Correlation	1.000**	1	1.000**
	Sig. (2-tailed)	0.000		0.000
	N	23	23	23
C	Pearson Correlation	1.000**	1.000**	1
	Sig. (2-tailed)	0.000	0.000	
	N	23	23	23

4. Interpretation

From the result of the bivariate correlation shown in table 4 for the actual amount spent on building maintenance from different sources in universities between 1995 - 2021, shows that all the relationship are in the positive direction, the bivariate correlation between internally generated revenue and the revenue from the Federal Government for building maintenance in Universities shows a significant perfect positive relationship exist with a P value of 0.000. Also, the extent of relationship between internally generated funding source and that of donations shows a significant perfect positive relationship exist with a P value of 0.000. Finally, the extent of relationship between revenue from the Federal Government and that of donation meant for building maintenance at universities between 1995 - 2021 shows a significant perfect positive relationship exist with a P value of 0.000.

Table 5 Summary of Statistical Analysis of Actual Amount on Maintenance of Buildings between 1995 -2021

S/n	Funds	P-value	Decision
1	A vs B	0.000	SD
2	A vs C	0.000	SD
3	B vs A	0.000	SD
4	B vs C	0.000	SD
5	C vs A	0.000	SD
6	C vs B	0.000	SD

Source: Researchers field survey 2021
A= Internal Generated Revenue, B=Federal Government Revenue, C = Donations, SD=Significant Difference

4.1. Decision Rule

Table 6 Regression Analysis of Actual Amount of Maintenance of Building within 1995–2021

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	1.000[a]	1.000	1.000	0.05377

(a) Predictors (constant) Actual amount. Source: Researchers field survey 2021

Table 7 Analysis of Variance for the Model

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1686456232.594	1	1686456232.594	583412483282.486	0.0000[b]
	Residual	0.064	22	0.003		
	Total	1686456232.658	23			

Predictors (constant) Actual Amount. Source: Researchers field survey 2021
Dependent variable: funding of maintenance of building

Table 8 Coefficients of the Variable

	Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.008	0.014		-0.585	0.564
	VAR00002	1.667	0.000	1.000	763814.430	0.000

Predictors (constant) Actual Amount. Source: Researchers field survey 2021
Dependent variable: funding of maintenance of buildings

Since the significant difference P–value = (0.000) of the Pearson correlation is less that 0.005 level of significant, we reject the null hypothesis which says that the approach to funding of maintenance of buildings do not have significant relationship with conventional sources of funds in educational institution and accept that the approach to funding of maintenance of buildings do have significant relationship with the conversional sources of funds in educational institutions.

4.2. Statistical Results

The regression model summary in table 8 shows that the correlation coefficient (R) of 1.000 indicates a very strong linear relationship between the federal governments generated revenue, internally generated revenue and donations. The coefficient of determination (R^2) value of 1.000 indicates that almost all the variations that exit in funding of maintenance of building in educational institution were accounted for and the significant difference of the F-statistic is less than 0.05 indicating an overall significance.

4.3. Decision Rule

Since the significant difference, P-value- 0.000 at which the regression coefficient B (1.667) was obtained is less than 0.05, we reject the null hypothesis which states that the approach to funding of maintenance of buildings do not have significant relationship with the conversional sources of funds in educational institutions and accept that, the approach to funding of maintenance of buildings have significant relationship with the conversional sources of funds in educational institutions. This implies that the management of the institution needs to explore other ways and means of generating funds for effective maintenance of buildings.

5. Discussion

The research is based on evaluate the level of maintenance within the ambits of budgetary provisions in Universities. Some of the key issues arising from the research show that, our greatest economic and social problems as a country is that, Nigerians has a poor attitude towards building maintenance and has no maintenance culture, especially government owned properties. In place of the preservation of existing stock, new projects were springing up. This indicates that the learning environment in our Universities is unhealthy with decayed and dilapidated buildings, which seriously undermines the objectives of education. These results mostly corresponded to other studies conducted by researchers.

Okoye and Ogunoh [24] state that an average Nigerian has a poor attitude towards building maintenance, especially government owned public schools. Okolie [22] study reveals that, lack of maintenance culture of buildings in our universities has led to unproductive learning environments in the Nigerian university system. In a similar vein, Akingbohungbe [3] states that, maintenance culture remains low at individual and government levels, that the area of maintenance of existing buildings has been seriously neglected. While Kunya et al. [13] investigations indicate that, much emphasis is placed in the public sector on the construction of new building structures, while maintenance, which is supposed to start immediately the builder leaves the site is taken for granted.

Similar to this finding Babbie and buys et al. [6, 7] research reveal that restrictions on government subsidies to Universities have resulted in frequent reductions in maintenance budgets resulting in a substantial decline in the condition of buildings over a number of years. Obi [14] in a similar study, stressed that, over the last two decades or so, even the stone deft hard of how education is denigrated as a result of under-funding, funds mismanagement. This is not surprising according to Aina and Aliyu [2, 5] because in recent times, government revenue have reduced considerably, due to dwindling oil revenue and rising debt services obligating. He lamented that, the under-funding in Nigeria higher education system has reduced research activities and quality of teaching. These findings corroborated in part similar work of Okolie [22] that, funds for maintenance of buildings in educational institutions are grossly inadequate and the delay in releasing of funds for maintenance, hinders maintenance activities in educational institutions. There is no doubt, to ensure efficiency in the maintenance, of infrastructure in our educational institutions; they must be managed like a business not a bureaucracy. Government should therefore, budget adequate funds for maintenance.

6. Conclusion

The research is based on evaluate the level of maintenance within the ambits of budgetary provisions in Universities. Our greatest economic and social problems, as revealed in this research is that an average Nigerian has a poor attitude towards building maintenance, which implies that Nigerians has no maintenance culture, that in place of the maintenance of existing buildings, new building projects were springing up. This research has shown that funds

budgeted and allocated for maintenance of buildings in educational institutions are grossly inadequate and delays in releasing of funds from government for maintenance hinders maintenance activities in the institution. These has resulted to wide spread of maintenance problems among others as cracks, dampness and mould stains on the walls, beams, columns, expansion joints, floors/finishes, damaged roofs/ceilings electrical and plumbing fittings.

From the results of investigations and analysis carried out, it could be concluded that the aim and objectives of this research have been achieved.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest in this manuscript.

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