

THE IMPACT OF MAINTENANCE STRATEGIES ON PHYSICAL CONDITIONS OF BUILDINGS IN PUBLIC SECONDARY SCHOOLS IN ONITSHA, NIGERIA

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ABSTRACT

This study examined the impact of maintenance strategies on physical conditions of buildings in the public secondary schools in Onitsha, Nigeria in order to offer view for enhanced building conditions of the schools. Survey design was used as research design. Quantitative and qualitative data were got. Quantitative data were gathered staff and school repairs supervisors using questionnaires. This study concentrated on (7) seven schools picked from the (23) twenty-three public secondary schools in the area of study centred on simple random sampling technique. Ownership structure was used as categorisation of the schools and they are church, private and government. Resulting from this stratification, balloting was done in the various sections to find the sample of the study. The no. of staff (as respondents) of the chosen schools was gotten and sample size formular was applied. Adequacy of adopted maintenance strategy and existing physical state (i.e.) conditions of buildings fit into interval scales, consequently Pearson Product Moment correlation tool was picked to test the significant relationship between them. The result recognised a significant relationship between the two variables. This indicates that the physical state/conditions of buildings are affected through maintenance strategy. This suggests that a good maintenance strategy may possibly dovetail in better-quality conditions of buildings. The study in conclusion noted that the State Government have a duty to advocate maintenance strategy for effective maintenance procedures in buildings of the public secondary schools.

Keywords: Buildings, maintenance, Public Secondary Schools, Physical conditions, Strategy

Article highlights

- A collaborative attempt should be made to adopt proactively preventive maintenance approach rather than ad-hoc maintenance while planned preventive maintenance programs should be incorporated in the school annual maintenance programs.
- A clear documented maintenance guideline should be adopted for managing maintenance operations and also support new and prevailing practices, as well as processes that are in usage in the schools. It is crucial to seek professional services of experts in the building industry to take periodic inspections of building conditions and create an inventory of building components that can provide insights on maintenance needs of the schools. Only maintenance managers with suitable expertise, and trainings to execute maintenance works should be engaged for proper maintenance operations in the schools. This study added to the existing body knowledge.
- The study has through its findings, recognised that proper maintenance strategy would enhance the physical state/conditions of buildings in the public secondary schools in Onitsha town, Anambra State, Nigeria. Similarly, it provided empirical data on the roles played by the several participants in charge of maintenance in the schools, it also adds to the body of knowledge by developing a maintenance model for improved building upkeep operations in the public secondary schools in the area of study.

Introduction

Physical conditions of buildings denote to the totality of peripheral effects that make the buildings comfy for the occupants. These conditions can also be seen as the entirety of the neighbourhood and satisfaction level of a particular dwelling unit gauged against various variables of liveability within an era. They also play a key part in people's health status as they have been noted to impact the physical, socioeconomic and emotional wellbeing of occupants [1]. [2] defined maintenance strategy as a lasting plan that covers all facets of maintenance activities. It outlines the systems and measures to be adopted in managing maintenance works as well as stipulates forms of works to be done. Buildings are intended to preserve the purpose and appealing values as when they were constructed provided adequate maintenance operations. Buildings are fundamentally essential to offer a supporting environment to augment numerous human undertakings. [3] noted that some buildings begin to display signs of decline in state as years go by, though at diverse magnitudes which is dependent upon construction techniques and materials, as well as usage. Consequently, as the building components start to show marks of deterioration, it turns out to be germane that suitable actions are engaged to secure the buildings through suitable maintenance. But, this circumstances is not applicable in Nigeria as previous researches on school buildings exposed that they face the mutual challenge of deterioration as well as stresses from usage. [4] noted that these deficiencies in building conditions effect teaching, learning capabilities of students, as well as impend the users' well-being.

Building maintenance has constantly remained a neglected field of study in the construction industry, drawing only an inferred recognition of its significance within the industry and among building owners [5]. The study posited that a well-maintained building preserves its assets and physical structural prices for a lengthier period than the one that is neglected. The drive of maintenance is basically to keep buildings or infrastructure in safe and operative condition. According to [2], maintenance preserves the asset from deterioration and from being a counter production and source of discomfort to users. It should be noted that the neglect of building maintenance strategies as well as operations have been linked to the rise in degeneration of the building fabrics with harmful impacts on the consumers. It is worth mentioning, that the crux of maintenance is to keep buildings in a operational conditions, the arts of suitable maintenance boosts the life span [6]. Nonetheless, the routine of having things existing for standard usage in the planned life span is significantly lacking in Nigeria, leading to the poor state of infrastructure. Similarly, [7] and [8] stated that continuous negligence of buildings amasses great maintenance bills and has effects on the users' productivity. The maintenance strategy is adopted is often key to the physical conditions of the buildings.

Given the crucial part of education in the society, sufficient maintenance consideration has to be a crucial tool in the running of public secondary school. [5] opined that the necessity to keep the buildings in good condition demands that maintenance of the buildings and other amenities are to be put into considerations constantly. In order to sustain the functionality and curtail maintenance complications that sets in upon completion of the buildings, occupied or not. [9] and [10] affirmed that maintenance operations plays an essential part in school buildings and the physical conditions can impact on the academic achievements of the students. [4] similarly observed that a decent school scenery offers an environment where education can be a lasting enterprise that permits students to distinguish themselves for self-development. It was additional noted that the declining outcome on building conditions in schools everywhere real maintenance is deficient, affect administration in addition to academic undertakings in the schools.

The state of affairs in Onitsha, Anambra State, Nigeria, is not dissimilar from the common picture in Nigeria. A pilot survey established vast proof of the awful conditions of buildings in public secondary schools. A cautious remark of the conditions of buildings is a strong indication of a major problematic situation with lack of maintenance actions in the schools. Several building fabrics exhibited signs of inadequate maintenance and repair. Since efforts have not been tailored to examine the state of maintenance processes in the public secondary schools in the area of study to note improvements needed, this investigation, consequently, wanted to explore the occurrence. The objective of this study is to examine the impact of maintenance strategies on physical conditions of buildings in the public secondary schools in Onitsha, Nigeria. This is with the view to providing constructive criticism for enhanced building conditions in the area. A hypothesis was put forward for this study which is that- there is no significant relationship between the adequacy of adopted maintenance strategy and the physical conditions of buildings in public secondary schools in Onitsha, Nigeria

Study Area

The study area is Onitsha, one of the commercial nerve centres in Anambra State, Nigeria. Onitsha is situated in the western side of the State and by the bank of the River Niger. The positions in latitudes $6^{\circ}8'N$ and $28^{\circ}7'N$, longitudes $6^{\circ}47'$ and $8^{\circ}48'E$ with a projected 104sq.km as land area [11]. Figure 1 shows the two Local Government Areas, Onitsha North and South. According to [12], population of Onitsha North L.G.A. and 125,918 in 2006. That of Onitsha South L.G.A. was 137,191 in 2006 National Population Census. It is a link metropolis between Eastern and Western parts of Nigeria. Twenty-three (23) public secondary schools in Onitsha as shown in Figure 2 and Table 1.

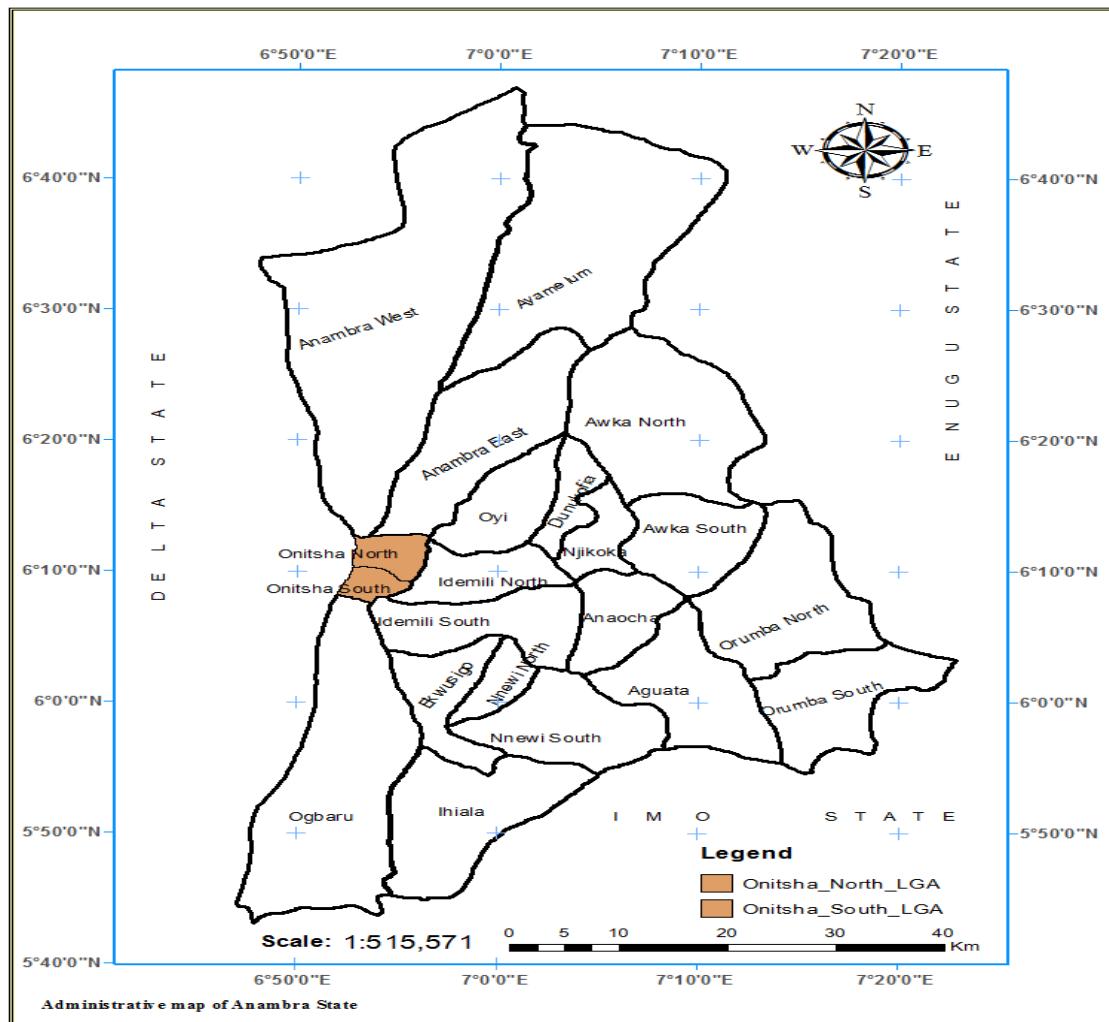


Figure 1: Map showing Onitsha North and South Local Government Areas

Source: Department of Environmental Management, COOU, (2017)

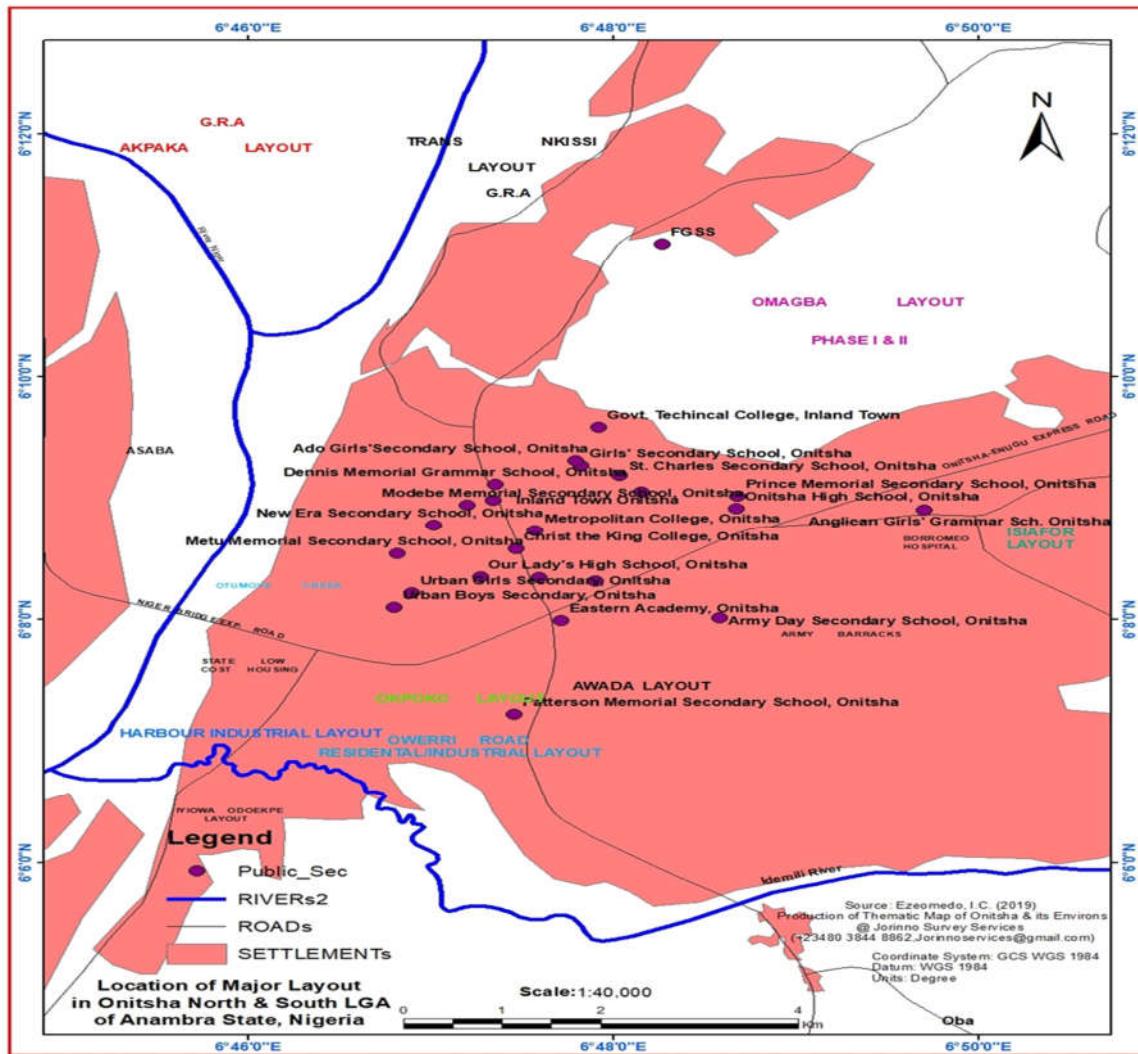


Figure 2: Location map of the public secondary schools in Onitsha

Source: Department of Environmental Management, COOU, 2019

Table 1: Street guide for the public Secondary Schools in Onitsha

S/N	List Of Public Secondary Schools In Onitsha	Street Address
1	Dennis Memorial Grammar School, Onitsha.	4 Oguta Rd, Odoakpu.
2	Girls' Secondary School, Onitsha.	Omagba phase II off Awka Rd.
3	Queen of Rosary School, Onitsha.	Niger Bridge Layout, along Oguta Rd.
4	Ado Girls' Secondary School, Onitsha.	GRA, off Awka Rd.
5	St. Charles Secondary School, Onitsha.	Omagba phase II off Awka Rd.
6	Eastern Academy, Onitsha.	Along Onitsha-Enugu Rd, off flyover bypass.
7	New Era Girls' Secondary School, Onitsha.	Along St. John of cross Rd, City Center, Odoakpu.
8	Inland Girls' Secondary School, Onitsha.	Niger Bridge Layout, Oraifite Rd.
9	Washington Memorial Secondary School, Onitsha.	GRA, off Awka Rd.
10	Patterson Memorial Secondary School, Onitsha.	Awada Layout, Owerri Rd. by Ojoto street.
11	Prince Memorial Secondary School, Onitsha.	Omagba phase II, water works Rd.
12	Anglican Girls' Grammar School, Onitsha	Off Limca Rd.
13	Army Day Secondary School, Onitsha.	Awada Layout
14	Metropolitan College, Onitsha.	Niger Bridge Layout, along cemetery Rd.

15	Govt. Technical College, Inland Town, Onitsha.	GRA, off Awka Rd.
16	Onitsha High School, Onitsha.	Woliwo City Center, Odoakpu.
17	Our Lady's High School, Onitsha.	Along Iweka Rd, off Okagbue/Agba street,Odoakpu.
18	Christ The King College, Onitsha.	Menax hospital street, by Oguta Rd. Odoakpu.
19	Modebe Memorial Secondary School, Onitsha.	City Center, Odoakpu.
20	Metu Memorial Secondary School, Onitsha.	Odoakpu VII, City Center.
21	Urban Girls Secondary School, Onitsha.	Uzodimma Street, Fegge.
22	Urban Boys Secondary School, Onitsha.	Palmer/Abagana Street,Fegge.
23	Special Sec. Sch. (Deaf And Dumb) Odoakpu, Onitsha.	Odoakpu.

Source: Field study, 2019

LITERATURE REVIEW

A considerable amount of studies on the physical conditions of buildings and maintenance strategies in public secondary schools in Nigeria have been mooted in literature. However, outcomes from some studies revealed that a large proportion of the facilities in public secondary schools are in a deplorable condition. [12] highlighted that about 75% of the school infrastructure in the Project States in Nigeria were estimated to be in very poor condition. The major reason for the existing chronic condition in the Education Sector, predominantly infrastructure, have been neglected for approximately 20 year period during the military regime. Sadly, the situation has become worrisome as the quality of most buildings constructed in recent years have reduced owning to poor procurement standards, poor labour, ineffective construction management, using poor quality materials during construction, lack of proper supervision during construction and illicit interference by politicians. It further expressed dismay over situations where buildings which were constructed to an acceptable standard (particularly those more than 20 years old) were neglected due to severe cases of lack of maintenance. This in turn, has resulted in many buildings being in poor condition and consequently, having a reduced lifespan.

[7] studied conditions of infrastructure in public secondary schools in Ogun State of Nigeria and detected that a considerable ration of the infrastructures were in a state of poor condition due to poor attitude of the users, lack of maintenance culture and inadequate funding and highlighted the need for resolving them. [13] assessed the state of facilities in public schools in Delta State, Nigeria and observed that amenities in the schools were largely in poor condition and that maintenance jobs carried out on them were insufficient for most of them resulting from extra pressure on existing facilities and deferred maintenance amongst others. Recommendations were made to the stakeholders to develop and inculcate good maintenance culture, while allocate adequate funds should be allocated to schools for efficient management of the existing facilities in the school. Similarly, [14] evaluated the maintenance of existing secondary school facilities in Cross River State. Based on the findings, the study suggested the need for development of sustainable maintenance culture in secondary school learning facilities in Cross River State and Nigeria at large. Further challenges outlined in the study were that some of the buildings in the public schools were inhabitable for users, while service conditions of both external and internal facilities in these buildings were in terrible situations. It attributed the causes of the menace to bad management, unethical practices, and absence of maintenance programme. In conclusion, the study recommended that maintenance culture be included in national educational curriculum, maintenance policy be formulated and facility managers appointed in all the schools to ameliorate the menace. [15]; [16] noted that strategic framework for maintenance of school buildings, Asset Management Plans (AMP) and involvement of private sector could help in school infrastructure maintenance.

Further advocacy for improved maintenance of public secondary school buildings could be seen in some documented research work by [17]. The study examined the condition in which the school environment and infrastructure were and how they impact on teaching and learning activities as well as their level of maintenance. The study recommended an effective collaboration between the school management and other stakeholders in education so as to contribute considerably to the improvement of education environment, also to produce an added enabling environment for working and ensuring viable excellent teaching in public secondary schools in Nigeria.

Maintenance management strategies

There are basically three methods of maintenance management approaches in use: in-house, outsourcing/contract and partnership [18].

i. In-house maintenance-

This approach involves employing some persons or using inside staff exclusively to concentrate on evolving an approach to manage maintenance works. The process is to lessen the possibility of the strangers knowing the undertakings of the organisation and to employ the useful skills and proficiency of staff. [18] noted that the principal check to this method is that the staff might lack the requisite abilities and proficiency on all the building components which thereby requires fetching one with such expertise as it may not be frugally viable to the establishment.

ii. Outsourcing approach -

Maintenance management by outsourcing applies where an organization appoints an agent to recommend and accomplish the services required to sustain the buildings. The benefit of this is that the organization employs a wide assortment of services and keep greatly skilled and proficient workers in maintenance management delivery.

iii. Partnership approach -

This involves an amalgamation of in-house and outsourcing management methods. For this approach to be successful, a specific type of policy setting out the tasks is required to ensure effective collaboration of both parties at several stages and strengths.

Cash's Model Concept which guides building evaluation and upkeep was assumed for this study. This was developed by Carol Cash in 1993. The model as explained in Figure 3 was designed to demonstrate some possible factors that influence the building condition as well as impact on student achievement and behaviour.

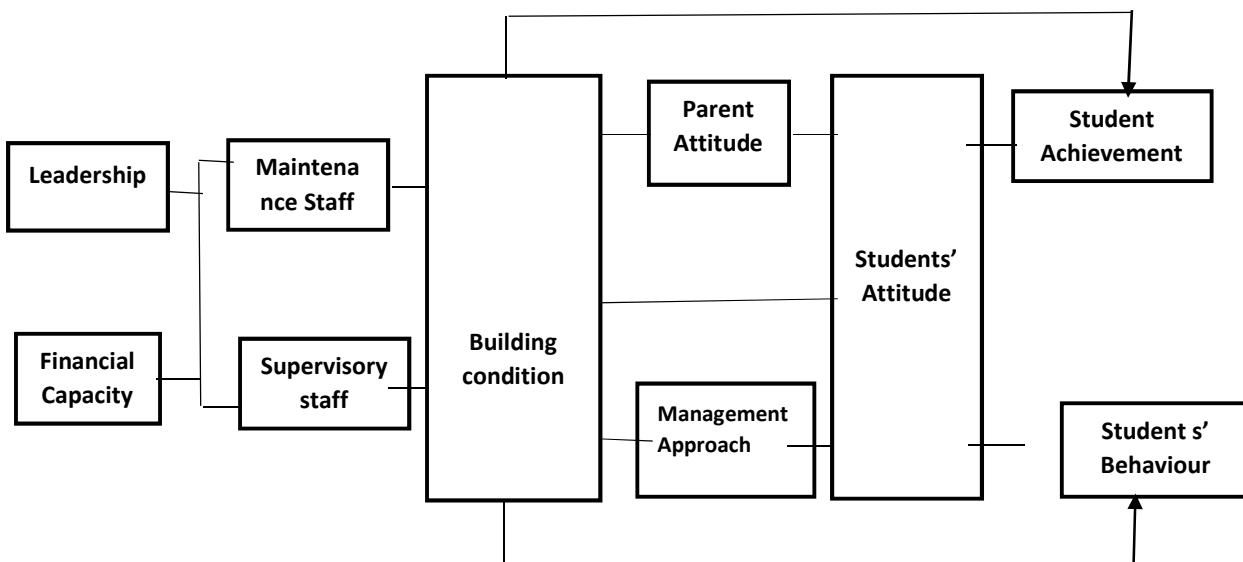


Figure 3: Flow Diagram of Cash's Model

Following the illustrations in Figure 3, Cash elucidated the impact of leadership and financial ability on maintenance and supervisory staff, which likewise, have an agreeing significance on conditions of school buildings. Similarly, the theory established the impact of conditions of school buildings on the approach of students, parents, and faculty, whereas the attitudes of the parents and teachers have predominant effect on students' perception of the building.

Consequently, the conditions of the school building, which is a product of administrative action and financial ability, impacts on the academic performance and behavior of students [19].

METHODOLOGY

Survey research design was assumed for this study; through with the use of a questionnaire, observation and schedule. These were used to obtain data from respondents. The research population for this research comprised classroom, and other ancillary units in the schools under investigation. A multi-phase grouped random sampling method was implemented for the study. Note, this study is part of a wider study done in the study area. At the first stage, stratification of the schools centred on the ownership arrangement of the schools before government took-over in 1970. This was principally imperative because of the probable consequence proprietorship may have on maintenance as displayed in Table 2.

Table 2: Classification of Schools based on ownership

S/N	Church	Private	Government
1	Dennis Memorial Grammar School, Onitsha.	Eastern Academy, Onitsha.	Girls' Secondary School, Onitsha.
2	Queen of Holy Rosary College, Onitsha.	Washington Memorial Secondary School, Onitsha.	Ado Girls' Secondary School, Onitsha.
3	St. Charles Secondary School, Onitsha.	Patterson Memorial Secondary School, Onitsha.	New Era Girls' Secondary School, Onitsha.
4	Anglican Girls' Grammar School, Onitsha	Prince Memorial Secondary School, Onitsha.	Inland Girls' Secondary School, Onitsha.
5	Christ The King College, Onitsha.	Metropolitan College, Onitsha.	Army Day Secondary School, Onitsha.
6		Modebe Memorial Secondary School, Onitsha.	Govt. Technical College, Inland Town.
7		Metu Memorial Secondary School, Onitsha.	Onitsha High School, Onitsha.
8		Our Lady's High School, Onitsha.	Urban Girls Secondary School, Onitsha.
9			Urban Boys Secondary School, Onitsha.
10			Special Sec. Sch. (Deaf And Dumb) Odoakpu, Onitsha.

Source: Anambra State Ministry of Education (2018)

A sample of seven schools was picked from the population. Assuming a technique of comparative allocation where the various clusters were kept relative to the ratio of their input to the population. These schools were arbitrarily picked to characterise the several groupings of ownership:

- A. Church owned: Christ the King College, Dennis Memorial Grammar School.
- B. Private owned: Metu Memorial Secondary School, Modebe Memorial Secondary School, Onitsha.
- C. Government owned: Urban Boys Secondary School, Ado Girls' Secondary School, Govt. Technical College, Inland Town

To determine the size of respondents upon which the questionnaires were administered, the number of staff in each sampled school were obtained from the schools.

Cochran formula was applied to obtain the data obtained for the staff population (i.e. respondents' size)

$$n = \frac{z^2 \times \sigma_p^2 \times N}{[N-1]e^2 + (z^2 \times \sigma_p^2)} \quad [20]----- (Equation 1)$$

Where:

n = Sample size

N = Research population for the study (454 staff)

σ_p = Assumed standard deviation (0.5)

ϵ = Significance level = 0.05

Z = Standard variate at a given confidence level = 1.96 for a 95% confidence level.

These were substituted into the formula to obtain the respondents' population. The obtained sample size for respondents' population was then distributed across the selected schools according to the proportion of their contribution to the study population. The results of the computed sample size for the respondents from the schools are presented in Table 3.

Table 3: Calculated respondents' population

S/n	Name of school	Number of existing staff	Sampled
1	Christ the King College.	112	52
2	Dennis Memorial Grammar School.	116	54
3	Metu Memorial Secondary School	35	17
4	Modebe Memorial Secondary School.	37	17
5	Urban Boys Secondary School	40	19
6	Ado Girls' Secondary School	64	30
7	Govt. Technical College, Inland Town.	50	23
	TOTAL	454	209

Source: (Fieldwork, 2019)

Based on the obtained respondents' population, copies of questionnaires were administered as follows:

Christ the King College = 52 copies

Dennis Memorial Grammar School = 54 copies

Metu Memorial Secondary School= 17 copies

Modebe Memorial Secondary School = 17 copies

Urban Boys Secondary School= 19 copies

Ado Girls' Secondary School =30 copies

Government Technical College = 23 copies

RESULTS AND DISCUSSION

The Descriptive summary measures as well as occurrence distribution for the variables examined were calculated. The Pearson's Product Moment Correlation analysis tool was used to test the significant relationship amid the interval variables selected from the research data with the aid of (SPSS) Statistical Package for Social Sciences.

Grouped data analysis of funding bodies responsible for maintenance

From the investigation of this variable as presented in Figure 4, the result infers that P. T.A. is the major sponsor of maintenance activities within the study area followed by original owners of the schools prior to government take-over, Old Students Association and Anambra State Ministry of Education. Since this result implied that Anambra state government is not the lone benefactor of maintenance activities in those schools. It is advocated for school management to strive for financial backing from other participants like PTA, old students associations and original owners to complement the State Government's contribution for maintenance activities in their schools. This is also in line with [16].

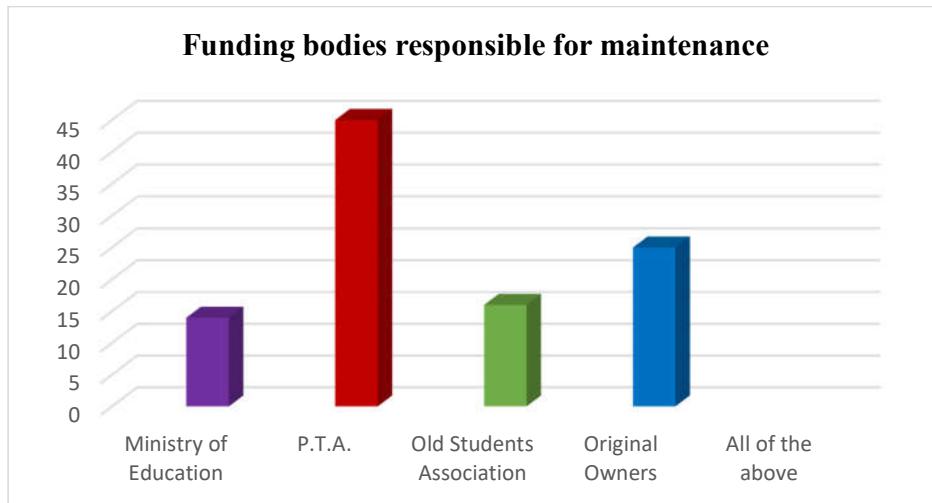


Figure 4: Analysis of funding bodies responsible for maintenance

Source: Fieldwork (2019)

Aggregated analysis of Maintenance procurement strategy

The data in Figure 5 revealed that 41% of responses showed that their schools engaged in in-house maintenance approach, 33% adopted direct labour approach, 26% outsourced their maintenance works while no school adopted partnership approach. This suggests that in-house approach was the most commonly adopted approach within the sampled schools. [21] opined that management of schools should always look at risk-based management in maintenance of facilities with public schools in the USA. With the in-house approach, it would always be easy to carry out maintenance works.

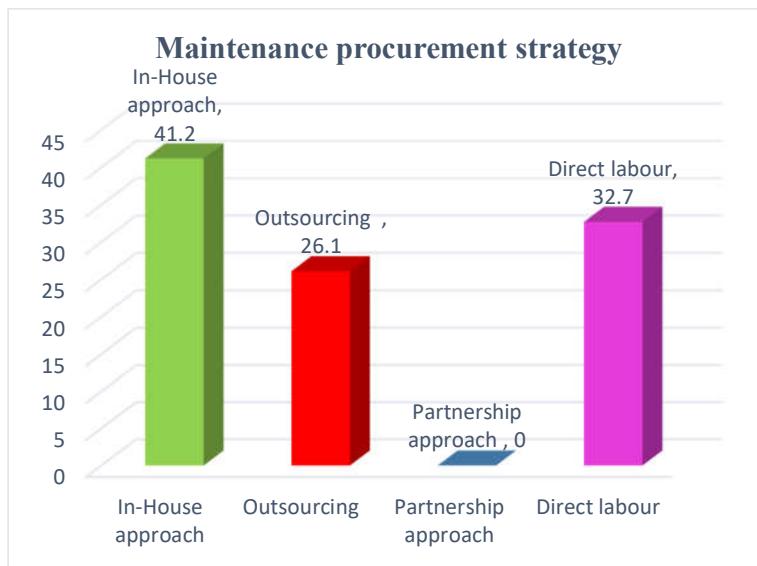


Figure 5: Analysis of Maintenance procurement strategy

Source: Fieldwork (2019)

Aggregated analysis of adequacy of adopted maintenance approaches

The results in Figure 6 is an indication that the adopted maintenance approaches in the schools were adequate as majority of respondents 28% and 27% indicated that the maintenance approaches were fairly adequate and adequate whereas a smaller proportion 19% perceived the adopted approaches as being inadequate and (16% and 10%) showed the maintenance approaches were very adequate and very inadequate respectively.

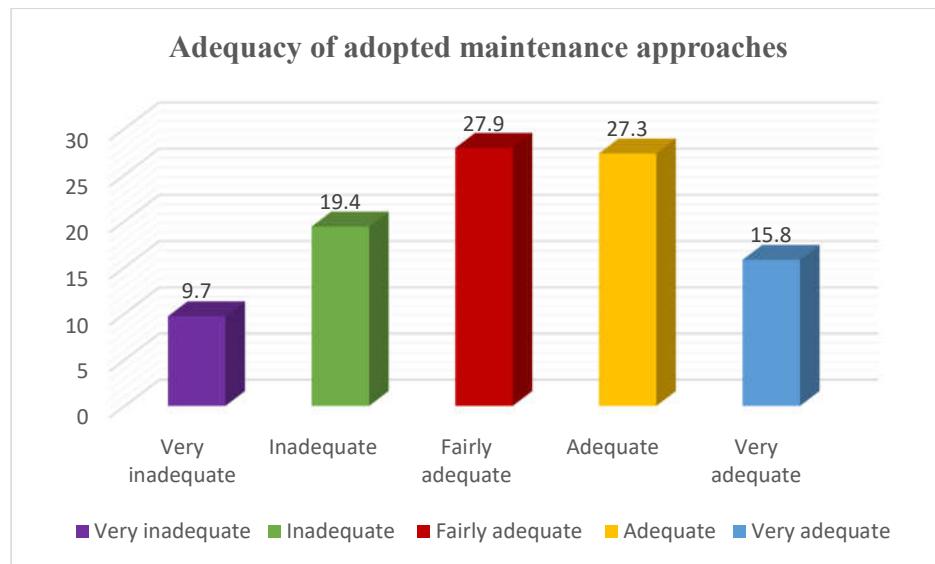


Figure 6: Analysis of adequacy of adopted maintenance approaches

Source: Fieldwork (2019)

Grouped analysis of physical conditions of the school buildings

It is apparent from study that the physical conditions of majority of the schools buildings were in mostly poor state. some prominent amount of damages were noticed on the building elements, these include cracks on walls, paint peelings, dampness of the walls, material dilapidation, stains, damaged louver blades, broken sanitary fixtures and rusting. However, the result as illustrated in Figure 7 also suggested that some buildings at the appraised schools were in good conditions due to certain distinct features on the building elements whereas a few were in adequate state. [22] further advocated that design of buildings should be in a way that it should not pose maintenance problems

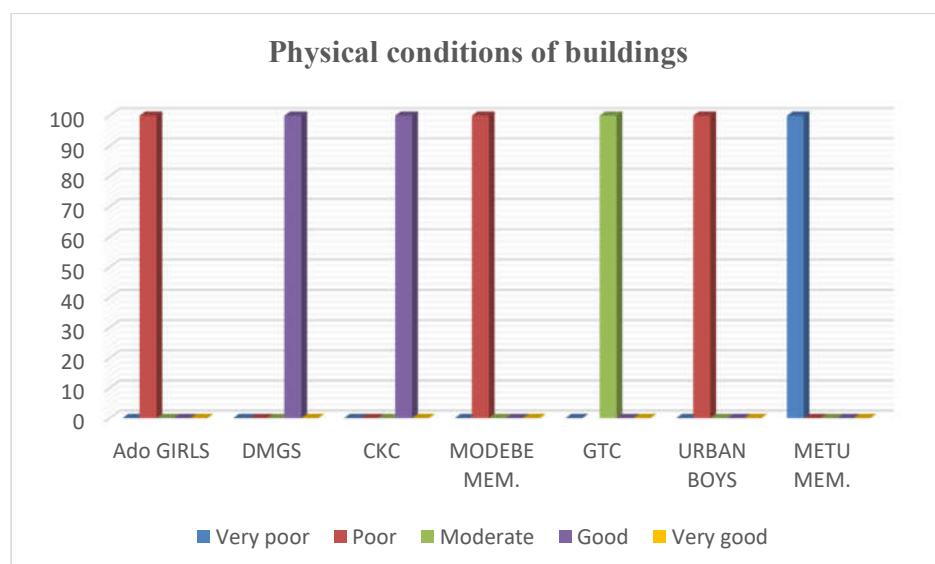


Figure 7: Analysis of physical conditions of buildings

Source: Fieldwork (2019)

Test of Hypotheses

The hypothesis stated there is significant relationship between the adequacy of adopted maintenance strategy and the physical conditions of buildings in public secondary schools in Onitsha, Nigeria was tested. The two variables are of interval scales, therefore, the Pearson Product Moment Correlation (PPMC) was used to test the significant relationship between them. The data analysis bared a correlation coefficient value of 0.646 with a probability value of 0.000 which demonstrates a strong relationship exists between the two variables. The result therefore, implies that the earlier proposed null hypothesis is hereby rejected and an alternative which states that '*there is significant relationship between the adequacy of adopted maintenance strategy and the physical conditions of buildings in public secondary schools in Onitsha, Nigeria*' accepted. These are displayed in Table 4.

Table 4: PPMC analysis result of relationship between AADMA and PCB

		Physical conditions of buildings
	Pearson Correlation	.646**
Adequacy of adopted maintenance approaches	Sig. (2-tailed)	.000
	N	165

Source: Fieldwork, 2019

Coming from the outcomes of the inquiry of data collected, it was recognised that there is significant relationship between the adequacy of adopted maintenance strategy and the physical conditions of the buildings in public secondary schools in Onitsha, Nigeria. This confirms that the physical conditions of buildings are principally swayed by maintenance strategy in the schools which suggests that proper maintenance strategy operations could result to enhanced conditions of buildings in the schools. This in-house strategy should be encouraged across the schools as the analysis showed that most of the schools adopted it. This was validated by the interviews conducted with the management staff of some of the schools who noted there was poor maintenance strategy and practices in the public secondary schools in Onitsha, Nigeria affect the physical conditions of the building. During the interview sessions, there was a undivided position that if it gets sufficient consideration, the conditions of the buildings would be greatly enhanced.

Conclusion

Driven by the evidence from the research findings, the following recommendations were considered necessary to ameliorate the influence the impact of maintenance strategy on the physical conditions of buildings in the study population: Anambra State Government ought to articulate maintenance strategy as well as improve on least maintenance principles for effective maintenance tasks in public secondary school buildings in the state. School managers should be equipped with requisite maintenance manpower through acquisition of proper qualifications, skills and experience to accomplish maintenance works in the schools. The schools should adopt proactively, preventive maintenance approach into their systems rather than ad-hoc maintenance while planned preventive maintenance programs should be incorporated in the school annual maintenance works program.

Declarations

Availability of Data and Materials: The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing Interests: The authors declare no potential conflicts of interest concerning the research, authorship, and publication of this article.

Funding: The authors received no financial support for this article's research, authorship, or publication.

Authors' contribution: Nkechi Maryann Maduka, conceptualised the study and develop the research strategy. Chukwunonso Obiefuna Umeora assisted by Chijioke C. Onwuzuligbo worked on data analysis, developed and revised the final manuscript. Chrales C. Munonye and Oluchi C. Ifebi assisted Nkechi Maryann Maduka in data collection. All authors performed the literature search and data extraction. All authors contributed to the qualitative synthesis and analysis of the individual findings. All authors confer rights to Chukwunonso Obiefuna Umeora to make any necessary changes to the manuscript in correspondence with the journal.

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