Evaluation of the Effect of Physical Facilities Management and Maintenance in Nnamdi Azikiwe University Awka, Anambra State Nigeria

JOSEPHINE NJIDEKA EZEUDOYE[1], PROF. F.I. EMOH[2], DR. C.P. IGWE[3]
[1, 2, 3] *Department of Estate Management Nnamdi Azikiwe University Awka Nigeria.*

Abstract- ***This study examined the effects of physical facilities management and maintenance in Nnamdi Azikiwe University, Awka with a view to improving the quality of existing facilities for academic excellence. With the aid of five objectives; identification of available facilities and its condition, and maintenance culture employed in the study institution, identification of regularity, effectiveness and functionality of existing facilities, adequacy of fund for maintenance, and adequacy of existing facilities in use for students and staff in the study institution, the aim of this study as stated above was achieved. Thus, it explored physical facilities in the study institution and ascertained the extent of its maintenance and impact it has on learning. Facility management is vital means through which adequate maintenance would be carried out. Good learning environment depends on the quality of existing facilities an academic institution has. The researcher adopts the use of both survey and case study methods using different data collection instruments viz; structured questionnaire, interview and personal observation. The sample size was determined using Taro Yamane's formula. A total of 395 questionnaires were distributed and 300 returned which correspond to 76% of the sample size which deemed fit for analysis. The data collected were subjected to descriptive and inferential statistical test. Tables, frequencies were used in the presentation of data. Freidman test, Two-Way ANOVA and Wilcoxon Signed Ranks Test statistical techniques were applied appropriately in testing the hypothesis. The study found out that there is significant difference between the mean responses of the different physical facilities with p- value less than 0.05. Also, the p- value of the different methods of maintenance is less 0.05 therefore there is significant difference between the different methods of maintenance. The study concluded that there is statistical significant effect of physical facilities management and maintenance of in Nnamdi Azikiwe University, Awka. The study also found out that there are insufficient facilities in the study institution, and some of the available facilities are readily available for use. There is an inadequate fund for the maintenance of existing facilities in the study institution. The study recommends the establishment of facility management unit to implement total cost management (cost estimation cost budgeting, and cost control), and provision of more facilities to match increase in students enrollment in the study institution. This will go a long way in improving teaching and learning process in the study institution.***

Indexed Terms- ***Facilities management, maintenance, physical facilities.***

I. INTRODUCTION

Facilities Management (FM) can be referred to as the practice of coordinating the physical workplace, work and the people in an organization in order to enhance service delivery and in turn create an enabling work environment for optimum output (Cotts, 1999). FM can also be said to involve guiding and managing the operations and maintenance of buildings, precincts and community infrastructure on behalf of property owners (Burt, 2012). It involves the day-to-day administration and control of manpower of all the support services necessary to maintain a business operation and allow it to achieve its corporate goals. According to Achoru (2015), FM is an interdisciplinary field and management concept, encompassing the seven principles of management that is, planning, organizing, controlling, motivating, coordinating, communicating and directing. Facility management has been described as being proper and

orderly in the maintenance of physical property created, constructed with the aim of reaping social or economic benefits. Created and manufactured facilities by their nature or virtually all man-made things are destructible. But the usefulness of such items can be extended by carrying out at regular intervals through an activity known as maintenance. Maintenance could be defined as the work undertaken to restore facility to an acceptable standard and at a minimum cost, and also getting personnel involved in the process and as well ensure their empowerment for quality work output (Iyagba, 2005). Un-sustainability of academic physical facilities as a result of intensive use of facilities without preservation and enduring rehabilitation programme is traced to four possible specific problems of explosion in students' enrolment, inadequate funding, absence of Facilities Management unit to implement Total Cost Management, absence of creative development and management of university facilities (Ajator, 2012). Currently, the physical planning units of our universities do not have adequate manpower and information technology facilities for the practical application of space factor in predicting, estimating and analyzing space need for efficient management of physical development of universities (Ajator, 2012). According to Olawunmi (1992), consequences of neglecting the aspect of management of quality in the maintenance of facilities, machines, and buildings, has resulted in the increase in maintenance cost and low building performance, wasted energy and effort, very complex service system with low reliability, lack of sufficient instrumentation for easy monitoring, lack of communication regarding maintenance issue. Educational facilities and its maintenance management is the basic focus in any higher institution because effective and efficient running of the system depend on proper maintenance and use of available structural units and facilities. Ogbodo (1995) defined educational facilities as those things of education which enables skilful teacher to achieve a level of instructional effectiveness that far exceeds what is possible when they are not available.

In Nnamdi Azikiwe University, Awka Anambra State, facility management unit is yet to be established. And it has been affecting the state of physical facilities in the institution. Students often complain of low level of maintenance of available facilities both in hostels and within school premises. Poor maintenance of available facilities can have negative effect on teaching-learning process.

Evaluation of effect of physical facilities management and maintenance is imperative as it will show the impact which facilities management would have on teaching-learning process study institution.

1.1 Aim and Objectives of the Study

The aim of this research work is to evaluate the effects of physical facilities management and maintenance in Nnamdi Azikiwe University, Awka Anambra State.

Specifically, this study seeks to achieve the following objectives:

i. To identify facilities available in the study institution.
ii. (ii) To identify the maintenance culture adopted and condition of facilities in the study institution.
iii. To examine the adequacy of fund and facilities in the study institution.
iv. (vi) To identify the regularity, effectiveness and functionality of facilities in the study institution.
v. (v) To ascertain the effect of facilities management on maintenance of physical facilities in the study institution.

1.2 Research questions

To achieve the aim and objectives of the study, the following questions were put forward: -

i. What are the facilities available in the study institution?
ii. What are the maintenance culture adopted and condition of facilities in the study institution?
iii. How adequate is the fund provision and available facilities in the study institution?
iv. How are the regularity, effectiveness and functionality of facilities in the study institution?
v. What is the effect of facilities management on the maintenance of physical facilities in study institution?

1.3 Research hypothesis

To guide the study, the following hypothesis was formulated: -

$H0_1$**:** Facilities management does not have significant difference on the maintenance of physical facilities in the study institution.

II. REVIEW OF RELATED LITERATURE

2.1 Concept of Physical Facilities

The school physical facilities are the material things that enhance better academic work in an educational institution. Educational facilities are the physical infrastructures that contribute directly or remotely to the teaching and learning process in the educational system. According to Enaohwo and Obasi (2000), they are status variables available in the school to provide the enabling environment under which appropriate processes take pace to determine expected outcomes in the institution. Olaniyonu and Gbenu (2007) described school facilities is a controlled environment which facilitate the teaching-learning process while they protect the physical wellbeing of the students. They are movable and immovable property, physical structures and assets belonging or allocated to an educational institution for use primarily for educational purpose (Amirize, 1999). According to Adeboyeje (1994), school physical facilities embrace school plants as well as consumables such as paper, pencil, chalk, gum, staples and pins. While Fedipe (1998) and Nnabuo (1997), view school plant purely as the non-consumable materials in the school for the promotion of teaching-learning process. From the above definitions, one can say that physical facilities are the essential components of the school system that have to be provided, maintained and well utilized for the achievement of educational goals and objectives. Thus, it covers variety of infrastructural facilities necessary for the survival and continuity of the school system which results in a successful teaching learning outcome. The main purpose of educational facilities is to aid, stimulate and facilitate instructional process. The provision of school physical facilities involves a huge of sum of money by both government and community. Alexander (1996) states that "facilities are an organisation's second largest expense and can account for as much as fifteen per cent of turnover" and "they are also the largest item in the balance sheet, typically over twenty per cent of all fixed assets". They are of great functional value to teaching and learning in school and as such careful and efficient management of these facilities are needed.

2.2 Facilities in the Study Institution

The infrastructural development in higher education is complex cost intensive. This is because it involves provision of building, classroom, hostel, staff quarters, workshop, laboratories, Information Communication Technology (ITC) centre, libraries, health centre and sport facilities. It also includes provision of stimulating learning environment with adequate safety consideration. The physical facilities of Nnamdi Azikiwe University, Awka include the following:

a. Academic Buildings: Various faculty/department buildings, library and lecture theatres.
b. Communal/Social Buildings and Assets: Students' centre, central administration buildings, auditorium, museum/art gallery, bookshop, religious buildings etc.
c. Residential Building (Hostels) for students etc.
d. Site Development Facilities such as ground and circulation, areas development, water storage, electricity mains/generators.

Academic buildings include various faculties/department buildings. The law establishing the University made provision for only two (2) campuses: Awka and Nnewi. Awka campus is administrative headquarters of the university. The faculties domiciled at Awka campus are Arts, Biosciences, Education, Engineering, Environmental Sciences, Law, Management Sciences, Physical Sciences, and Social Sciences. The faculty of Agriculture is domiciled at Ifite-Ogwari premises of university, while the faculty of Pharmaceutical Sciences is domiciled at Agulu. Nnewi campus houses the college of health sciences and technology, which comprises the faculties of Medicine, Health sciences and Technology, and Basic medical Sciences. University Teaching Hospital is located 12 kilometers away from the Okofia premises along the Nnewi Ojoto-Oba road.

Nnamdi Azikiwe University Library is named after the first Vice Chancellor of the university, Prof. Festus Aghagbo Nwoko and was formerly opened in 2009. It provides students and scholars access to wide range of reference materials, such as multiple professional encyclopedias, numerous books, and thousands of magazines. It is located at the centre of the school purposely for proximity. Other libraries are the law, pharmaceutical sciences and medical libraries.

Lecture Theatre of the study institution is a large room with rows of seats where students sit to listen to

lecturers. The capacity of lecture halls is usually measured in hundred. It is almost always have a pitched floor, so that those in the rear are sat higher than those at the front (ie, tiered seating) allowing them to see the lecturers. The design of a lecture theatre has a significant influence on the learning experience. It is usually optimised for creating an environment which stimulates concentration and interaction. In the study institution, there are Juhel lecture hall, Right-health lecture hall, Alpha lecture hall and Green-life lecture hall.

Residential Buildings (hostels for students) are accommodation provided for students within and outside the study institution. Nnamdi Azikiwe university have the following hostels for its students- Nnamdi Azikiwe University hostel E located at Ifite-Awka, northeast of Ifite-Awka Hill, Unizik school hostels (blocks A and B), is a female hostel situated east of Ifite Awka close to study institution. Basil Oli hostel NAU is a male hostel within the school premise, and Elmada hostel Unizik is located inside Unizik at the back of administrative block with male and female blocks. These hostels have facilities like water and electricity supply, sports, security, access road etc. According to Okafor and Onuoha (2013), although some facilities were provided, the quality provided is adequate and mostly ill maintained. The reason for this situation is due to acute growth in population and inadequate fund provision, etc.

Communal/Social Buildings and Assets - Communal building is property that is shared by the people of a community in accordance with the uses and customs. They are buildings owned or managed by the school from time to time, for the benefit of, inter alia the association and its members and sub members. Communal buildings/assets in the study institution include UBA filing station, university auditorium, conference centre, university cooperative society building, university E library, university main library, university medical centre, Unizik 94.1 studio, Unizik business school etc.

Site Development Facilities – This refers to designed physical improvements or modifications to the campus landscape, excluding utilities and buildings. It is a broad physical framework for campus land use, facility location, circulation, natural systems, infrastructure and overall space organization. Site development is the process by which the ideas of a master plan are designed in detail and brought to realization on the ground. Site development facilities include ground and circulation areas development, water storage/reticulations, electricity main/generators, telephone, roads/sidewalks, street lighting etc. as comprehensively expounded in the National University Commission (NUC) Standard Guide, University of Nigeria Nsukka (UNN) Master plan (Uniplan consortium 1980) and University of Benin master plan (1993).

2.3 Condition of Facilities in the Study Institution

Blessing et al (2015) observed that higher education institutions face immediate pressure to preserve existing building facilities within the campuses and enhance the capacity of their higher education system to address growing demands of an increasing influx of students and academic activities. Nwagwu (1978) and Adesina (1983) argued that the quality of the school facilities available and the level of maintenance have positive relationship with the standard and quality of that of the attainment of educational goals and objectives. The availability and prudential management of facilities determines greatly the quality of instruction and performance of students in the school. According to Mbipom (2000), there is this belief that if the buildings in the school are well maintained and the grounds well kept, the same level of care, seriousness and high quality will also be extended to the academic programmes of the school. The implication of this statement is that the physical conditions and general appearance of school facilities constitutes the basis upon which members of the public pass their judgements about the academic programmes going on in the school. According to Okafor and Onuoha (2013), the condition of available facilities in study institution is below standard and even were up to standard, they were considered below the required capacity, and population growth has adverse effect in the number of facilities available. The pressure in these facilities is overbearing. This causes a rapid increase in the rate of deterioration of the facilities.

Unfortunately, the operation and maintenance of facilities in our tertiary institutions have become a serious problem to school administrators. Ogbodo

(1995) argues that if school physical facilities are not properly managed and maintained, they dilapidated and wear out faster than their normal life span and also if not properly utilized, the school system and the particular school units would not derive optimum benefit from their use. This means that the availability of functional facilities and equipment is a prerequisite for effective teaching and learning. In the study institution, the information from the field work shows that the available facilities are in a fair state, therefore need to be upgraded.

2.4 Adequacy of Facilities in the Study Institution

Adequate facilities means distribution lines or facilities having sufficient capacity to meet the maximum estimated service requirements of its existing customers and of any new customer occurring during the year following the commencement of permanent service and to assure all such customers of reasonable continuity and quality of service. According to data collated, available facilities in the study institution are not adequate considering the number of users.

2.5 Fund Provision and Facilities Maintenance

School building improvement and maintenance according to Department of Education (2010) are essential aspects of school plant management which require constant attention and careful planning by administrator. The educational administrators need to undertake the maintenance and minor repairs of the school buildings using available resources. This is necessary because educational buildings need to evolve and incorporate technical innovations in virtually all aspect of school facilities. School facilities maintenance affects the physical, education and financial foundation of the school organisation and should therefore be a focus of both its day-to-day operation and long rang management priorities. Effective facilities maintenance extends the life of older facilities and maximizes the useful life of newer facilities. Teaching and learning could be effective when there is good climate and conducive atmosphere in school. However, decline in educational achievement may not be limited to the shortcoming on the side of students and teacher alone. Considering the increase in students' enrolment in tertiary institution, that makes it a necessary for the government to provide adequate fund for the provision and maintenance of school facilities. Government at present is seemingly the sole financier of university capital programme. Due to the malfunctioning of the economy since the "pre SAP" regime of 1980s and the vacillation in revenues of government, funding of university projects have remain epileptic (Samaila, 1985). Government as the ultimate financier seem not to have specified capital allocation criteria and usually disregards the NUC system-wide funding recommendation for university project which meet the capital programme budgeting formula. The aggregate effect of these, is that physical facilities cannot be planned and developed to match the assessed enrolment level and modified the academic programmes of the university in the planned period (relying on government alone), resulting in excessive pressure on inadequate physical stock.

In view of significance attached to funding for maintenance of school facilities for the attainment of educational aims and objectives, this study was designed to find out the effect of facilities management on the maintenance of physical facilities of Nnamdi Azikiwe University, Awka and also examine the nature of funding for the facilities maintenance and its impact on teaching and learning, so as to make recommendations for the way forward.

2.6 Categories of Maintaining the Educational Facilities

i. The Emergency Maintenance - The institution should respond to emergency situation such as natural disasters (earthquakes, typhoon, flood etc) internal disasters (fire outbreaks, shooting etc) and disruptive services (electricity or water breakdown emptying soak away, repairing plumbing fixtures etc) any delay that require urgent attention will disrupt learning environment and teaching process, adversely impact on reputation of institutions, their core values, financials and would further risk the campus population. Regular building safety inspections on emergency services, electricity, gas, and water services are necessary steps to ensure the safety and health aspect of educational campus population.
ii. Pre-planned Routine Maintenance-This is scheduled comprehensive maintenance which should be undertaken periodically such as daily, forthrightly, monthly, quarterly, bi-annually and

annually. Examples of pre-planned routine maintenance include;

- Day today cleaning duties - The ground care (gardeners). They are responsible for managing the cleaning, leaves collections, drain cleaning, landscaping, up-keeping of the lawns and hedges of the institution.
- Maintenance employees undertake regular maintenance inspections, fix- up broken furniture, equipment or damaged doors and even repainting the building etc.
- Professional security staff is recruited to patrol the campus from time- to- time on vandalism of the institution's assets, protect students from various hazards or gangs fight and random security checks to avoid prohibited items and unauthorized people from entering the premises.
- The Predictive Maintenance - This trouble shooting maintenance system relies on the study of forecasting techniques and pre-emptive behaviour analysis of building maintenance system. Data from maintenance services are collated and undergone statistical analysis in order to provide comprehensive forecasting and pre-empting events that could occur under a certain set of permutations and combination.

iii. Corrective Maintenance – corrective maintenance involves remodelling, renovations and updating of existing facilities to avoid obsolesce and to make them adaptable to current educational needs (Akpan, 1999). Activities here include replacement of foundations walls and roofs of school buildings etc.

2.7 Facilities Management in Tertiary Institutions

The utilization of facility management practices may greatly simplify the process of managing and operating the facilities of higher education institution. Thus, this study aims to evaluate the effect of facilities management on the maintenance of physical facilities of Nnamdi Azikiwe university Awka. The growing trend is to view facilities management as the management of non-core company assets and activities to support and increase the efficiency of the core business of the study institution. Therefore, its goal has now become organizational effectiveness that is, helping the organization to allocate its resources in a way that allows it to flourish in competitive and dynamic market. The essence of strategic facilities management is making decisions in changing, uncertain, unpredictable and competitive circumstances (Nutt, 2000). The practice of Facilities Management (FM) is concerned with the process by which organizations ensure that their buildings, systems and services support core operations while contributing to the achievement of their strategic objective under stable business conditions (Bagshaw *et al.*, 2015). It focuses on matching limited resources to user needs with a view to securing higher quality, lower risks and value for money (Cotts, 1999).

The study institution is yet to adopt facility management practice. And this has contributes to the inefficiency in maintenance of available facilities. Thus, there is need to establish Facility Management Unit to Implement Total Cost Management. Therefore, the aim of this study is to evaluate the effect of facilities management on the maintenance of physical facilities in the study institution with a view to improving the state of available facilities as well as recommend installation of new facilities to march the increasing number of students.

III. RESEARCH METHODOLOGY

The research design for the study is survey method. Survey method involves giving out questionnaires to elicit information from respondents. It is a research method in which subjects respond to a series of statements or questions in a questionnaire or an interview. The study was carried out by administered structured questionnaires on students and staff in study institution. Thus, instruments for data collection are questionnaires, oral interview and physical observation.

IV. DATA PRESENTATION AND ANALYSIS

This section presents and analyses the data collected in course of the study. The data collected were analyzed using tables, percentage technique, frequency tables, two-way ANOVA. The statistical tools used in hypothesis testing were ANOVA, Friedman Test and Wilcoxon Test with the aid of Statistical Packages for Social Science (SPSS v. 23).

- Research Objective 1: To identify facilities available in the study institution.

The mean values for response were used to identify the availabilities of the various facilities in the study institution. The average cut-off used in this study is 0.7, any facility with mean response greater than or equal to 0.7 is deemed available in the study institution while any facility with mean response less than 0.7 is deemed not available in the study institution. The mean response is calculated as follows;

Mean response $= \frac{x}{300}$, where x is the response values

Table 1: Facilities Available in the Study Institution

S/NO	Facilities	Response	Mean response value (x)
1	Transportation	225	0.75
2	Water supply	117	0.39
3	Security	222	0.74
4	Drainage	198	0.66
5	Vehicle parking lot	249	0.83
6	Stand by generator	144	0.48
7	Seating	201	0.67
8	Sewage/ toilet	195	0.65
9	Sports/recreation	190	0.63
10	Library	261	0.83
11	Hostel accommodation	267	0.89
12	Software	156	0.52
13	Electricity supply	222	0.74
14	Laboratory	237	0.76
15	Refuse management	174	0.58
16	Building	225	0.75
17	Office	234	0.79

Source: Field Survey, 2021

From table 1, it will be seen that the mean responses of the respondents in respect of available facilities in the study institution varies, some are less than 0.7, while some are greater than 0.7 for the availability of facilities in the study institution.

From the above explanations, and information in the table, it means that the study institution has the following facilities:

a. Transportation
b. Security
c. Vehicle parking space
d. Office
e. Electricity supply
f. Building
g. Laboratory
h. Hostel accommodation
i. Library

While the following facilities are not available:

a. Water supply
b. Drainage
c. Stand-by generator
d. Seating
e. Sports/recreation
f. Software
g. Refuse management
h. Sewage/toilet

Non availability of these facilities in the study institution means that they are not readily accessible.

Research Objective 2: To identify the condition of facilities in the study institution.

The result presented in table 2 are for the state of available facilities, they are based on 5- point likert scale of Very Bad (VB=0.00-1.00), Bad (B=1.01-2.00), Fair (F=2.01-3.00), Good (G=3.01-4.00) and Very Good (VG=4.01-5.00).

Table 2: Condition of Facilities in the Study Institution.

S/NO	Item	Fair (F)
1	The condition of facilities in the study institution	2.3500 (F)

Source: Field Survey, 2021

For the condition of physical facilities, we can see in the table that they are generally in fair condition. With this, we have seen that there are physical facilities in the study institution and that they are in fair condition, as seen in the table 2 above.

Table 3: The table below shows the response values of the available facilities to methods of maintenance

	Trans	Sec	Vehicle parking	office	Elect supply	Lab	Hostel	Library	Total
preventive	3	2	1	2	2	3	1	1	15
Corrective	30	50	30	31	40	30	14	25	250
Predictive	2	1	1	1	1	2	1	1	10
Improvement	3	4	5	4	2	3	2	2	25
Total	38	57	37	38	45	38	18	29	300

Source: Field Survey 2021

For the types of maintenance employed for the maintenance of physical facilities in the study institution. Based on the information from field survey, we discovered that facilities are broken down before repairs are done. Therefore, corrective method of maintenance is usually employed for the maintenance purposes.

Research Objective 3: To examine the adequacy of fund and facilities in the study institution.

The adequacy of the facilities was cast on a 2-point likert scale of Not Adequate (NA=1) And Adequate (A=2). As already shown under objective one, the mean cut off point for the likert scale is 1.50; values greater than or equal to 1.50 signify adequate while otherwise signifies not adequate.

Table 4: Adequacy of Fund for Facilities Maintenance

S/NO	Item	Not Adequate
1	The adequacy of fund for maintenance	1.32 (NA)

Source: Field Survey 2021

From the table below, we can see that the available facilities in the study institution are not adequate for students and staff.

To identify the adequacy fund for facilities maintenance, the adequacy of the fund was cast on a 2-point likert scale of Not Adequate (NA=1) And Adequate (A=2). As already shown under objective one, the mean cut off point for the likert scale is 1.50; values greater than or equal to 1.50 signify adequate while otherwise signifies not adequate.

As contained in table 5, fund provided for facilities maintenance is not adequate. This inadequacy of fund is one of the major problems encountered in the maintenance of physical facilities in the study institution.

Table 5: Adequacy of Physical Facilities.

S/NO	Item	(NA)
1	The adequacy of facilities in the study institution	1.24

Source: Field Survey, 2021

From the table above, we can see that the available facilities in the study institution are not adequate for students and staff.

Research Objective Four: To identify the regularity, effectiveness and functionality of physical facilities in the study institution.

The results presented in the table are for the regularity, effectiveness and functionality of physical facilities, they are based on 5-point likert scale of Very Bad (VB=0.00-1.00), Bad (B=1.01-2.00), Fair (F=2.01-3.00), Good (G=3.01-4.00) and Very Good (VG=4.01-5.00).

From the table 6 below, we can see that for the regularity, effectiveness and functionality of the facilities in the study institution is in fair state which needs to be improved.

Table 6: Regularity, Effectiveness and Functionality of Physical Facilities in the Study Institution.

S/NO	Item	Study Institution
1	The regularity, effectiveness and functionality of facilities in the study institution	2.4830 (F)

Source: Field Survey

Objective Five: To evaluate the effects of facility management on the maintenance of physical facilities in study institution?

The response value of available facilities to different methods of maintenance were extracted and tabulated in table 13.

Table 7: The table below shows the response values of the available facilities to methods of maintenance

	Trans	Sec	Vehicle parking	office	Elect supply	Lab	Hostel	Library	Total
preventive	3	2	1	2	2	3	1	1	15
Corrective	30	50	30	31	40	30	14	25	250
Predictive	2	1	1	1	1	2	1	1	10
Improvement	3	4	5	4	2	3	2	2	25
Total	38	57	37	38	45	38	18	29	300

Source: Field Survey 2021

TWO-WAY ANOVA

A two-way analysis of variance was used to test whether there is a significant difference between the mean response of each of the physical facilities to the different method of maintenance and also to determine whether there is a significant difference between the different methods of maintenance.

H_0: There is no significant difference between the mean response of each of the physical facilities.

H_1: There is a significant difference between the mean response of each of the physical facilities.

H_0: There is no significant difference between the methods of maintenance.

H_1: There is a significant difference between the methods of maintenance.

Two-way ANOVA: response to maint. versus types of maint., physical facility

```
Source          DF      SS      MS
F       P
```

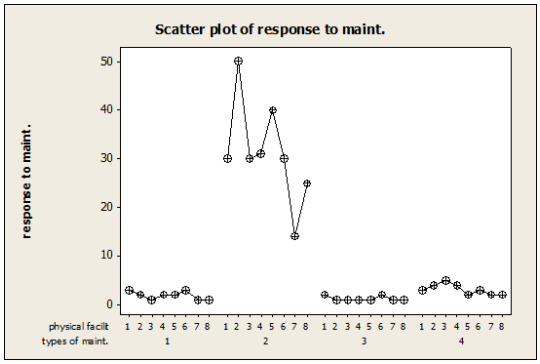
```
types of maint.    3  5118.75  1706.25
63.73  0.000
physical facilit   7   222.50    31.79
1.19  0.002
Error             21   562.25    26.77
Total             31  5903.50
                    Individual 95% CIs
For Mean Based on
types of            Pooled StDev
maint.      Mean  ---+---------+----
-----+---------+------
1           1.875   (---*---)
2          31.250 (---*---)
3           1.250  (---*---)
4           3.125    (---*---)
                   ---+---------+---
------+---------+------
                      0           10
20        30
```

```
                   Individual  95%  CIs
For Mean Based on
physical           Pooled StDev
facilities Mean    -+---------+------
---+---------+--------
1           9.50            (--------
*--------)
2          14.25                    (-
-------*--------)
3           9.25           (--------*-
-------)
4           9.50            (--------
*--------)
5          11.25              (------
--*--------)
6           9.50            (--------
*--------)
7           4.50    (--------*-------)
8           7.25        (--------*----
----)
                   -+---------+-----
----+---------+--------
                   0.0             6.0
12.0      18.0
```

INTERPRETATION OF THE MINITAB OUTPUT

The null hypothesis is accepted if the p-value is greater than 0.05, otherwise it is rejected. The p-value for the different physical facilities is less than 0.05, in this case the null hypothesis is rejected and we then conclude that there is a significant difference between the mean response of the different physical facilities. Also, the p-value of the different methods of maintenance is less than 0.05. Therefore, we reject the null hypothesis and conclude that there is a significant difference between the methods of maintenance.

The mean values of the different physical facilities were also obtained with security being the highest and hostel accommodation has the lowest mean value. The confidence interval for each of the mean values is given by their sides.



Source: Field Survey 2021

The graph above shows the distribution of how the available facilities respond to types of maintenance. The first graph is for the response of the facilities to the first maintenance which is preventive measure. The graph is almost a line graph, which means that the different facilities have almost the response to the preventive measure. The second graph is like a zig-zag, this displays many differences in response to the second type of maintenance called the corrective measure. The response to predictive and improvement measures are the same with that of preventive measures.

SPSS OUTPUT (FREIDMAN TEST)

The Freidman test was used to compare the mean ranks between the physical facilities and indicates how the groups differed A post hoc analysis with wilcoxon

sign-rank test was used to ascertain where the differences actually occur

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Transportation	4	6.2500	5.12348	1.00	12.00
Security	4	4.7500	4.11299	.00	10.00
parkingSpace	4	7.0000	4.76095	2.00	12.00
Office	4	8.5000	7.93725	1.00	18.00
Electricity	4	10.7500	9.06918	2.00	20.00
Building	4	6.5000	5.91608	1.00	13.00
Lab	4	9.5000	7.54983	3.00	17.00
Hostel	4	7.2500	6.39661	2.00	15.00
Libraray	4	14.5000	12.81926	3.00	30.00

Friedman Test

Ranks

	Mean Rank
Transportation	2.88
Security	2.50
parkingSpace	4.88
Office	5.00
Electricity	7.25
Building	3.13
Lab	6.38
Hostel	4.13
Libraray	8.88

Test Statistics[a]

N	4
Chi-Square	20.744
df	8
Asymp. Sig.	.0003

a. Friedman Test

Wilcoxon Signed Ranks Test

Test Statistics[a]

	security - transportation	office - parkingSpace	building - electricity	hostel - lab
Z	-1.289[b]	-.736[c]	-1.841[b]	-1.841[b]
Asymp. Sig. (2-tailed)	.0197	.0461	.026	.016

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Ranks

		N	Mean Rank	Sum of Ranks
security - transportation	Negative Ranks	3[a]	2.83	8.50
	Positive Ranks	1[b]	1.50	1.50
	Ties	0[c]		
	Total	4		
office - parkingSpace	Negative Ranks	2[d]	1.50	3.00
	Positive Ranks	2[e]	3.50	7.00
	Ties	0[f]		
	Total	4		
building - electricity	Negative Ranks	4[g]	2.50	10.00
	Positive Ranks	0[h]	.00	.00
	Ties	0[i]		
	Total	4		
hostel – lab	Negative Ranks	4[j]	2.50	10.00
	Positive Ranks	0[k]	.00	.00
	Ties	0[l]		
	Total	4		

Source: Field Survey 2021

a. security < transportation
b. security > transportation
c. security = transportation
d. office < parkingSpace
e. office > parkingSpace

f. office = parkingSpace
g. building < electricity
h. building > electricity
i. building = electricity
j. hostel < lab
k. hostel > lab
l. hostel = lab

4.1 INTERPRETATION OF THE FRIEDMAN TEST AND WILCOXON TEST

The Friedman test was carried out to support our result of the two-way analysis of variance done above. There is a statistical difference in the physical facilities, with chi-square 8.500 and p-value of 0.0003. A post hoc analysis with wilcoxon sign-rank test was used to acertain where the differences actually occur. Security differs with transportation with p-value of 0.019, office and parking space differs with p-value 0.0461, building and electricity supply differs with p-value of 0.026 while hostel accommodation and laboratory differs with p-value 0.016.

- Presentation of Research Hypothesis

The postulated hypothesis was tested; the results and interpretations are presented in this section. The hypothesis was tested using appropriate statistical methods/tools that fit the various data sets.

Hypothesis One: There is no significant difference between the effect of facilities management on the maintenance of physical facilities in the study institution.

The result of this has been presented and interpreted under objective five; with the result and interpretation, null hypothesis will be rejected and the alternative accepted.

- Summary of Finding

The study revealed the available physical facilities in the study institution which include. drainage, electricity supply, water supply, sewage/toilet, vehicle parking spaces, security, sport/recreation, laboratory, library, hostel accommodation, software, medical facilities It can be inferred that the study institution has many physical facilities that aid teaching and make learning easy for the respondents. It was also found that the available facilities are in a fair state of repairs.

For the adequacy of physical facilities and fund provision in the study institution, the study revealed that the physical facilities are inadequate and fund provision insufficient.

The type of maintenance employed in the study institution is mostly corrective method of maintenance as against preventive method

The study revealed the effect of facilities management on the maintenance of physical facilities in Nnamdi Azikiwe University, Awka. The effect of facilities management on maintenance of physical facilities was checked using Two-Way ANOVA; a two-way analysis of variance was used to test whether there is a significant difference between the mean response of each of the physical facilities to the different methods of maintenance and also to determine whether there is a significant difference between the different method of maintenance. The overall average mean response of the available facilities was used to fit a predictive model with the types of maintenance employed for facilities maintenance. The Freidman test was used to compare the mean ranks between the physical facilities and indicates how the groups differed. A post hoc analysis with wilcoxon sign-rank test was used to ascertain where the differences actually occur.

CONCLUSION

Maintenance of physical facilities in Namdi Azikiwe University, Awka is tormented by a number of factors arising from maintenance management system. These factors include: maintenance culture employed by the management of the institution, limited fund made available by the institution for maintenance irrespective of proposed sum for the year, absence of facility management unit within the institution to pilot the operation of maintenance process for efficient delivery of services, inadequate facilities due to increase in students enrollment etc.

Having seen gaps in the management of maintenance processes in the study institution, where non professionals spearhead maintenance of physical facilities. There is need to establish facility management unit to correct such anomaly. Installation of additional facilities to take care of inadequate facilities, occasioned by increase in students'

enrollment. Students complained of quality of existing facilities within the hostels and school premises which has affected learning -teaching process.

From the findings, there is variation in state of facilities and fund provided for facilities maintenance. This means that the amount of fund provided and types of maintenance employed for maintenance has significant effect on the state of physical facilities in the study institution. The statistical test conducted corroborated that there is strong positive statistically significant effect of facility management on the maintenance of physical facilities in Nnamdi Azikiwe University, Awka. Therefore, facility management is necessary, and also plays a significant role in determining the state of physical facilities through adequate maintenance programme in the study institution. The results of the study have provided some insight on the effect of facilities management, especially the strong positive side, as the aim of facility management is to provide adequate maintenance of existing facilities to elongate their lifespan, aid teaching and facilitate learning and manpower training for national development. Government and educational planners should make adequate consideration on how to provide constant renovation and reconstruction of dilapidated facilities in various academic/tertiary institutions.

RECOMMENDATION (S)

Provision of physical facilities in an academic institution for the training of manpower is a primary function of government. Where facilities are adequately provided and efficiently managed in an academic institution, potential students are usually attracted to such institution. Therefore, government and educational planners have a major role to play, since the cost of providing most of these facilities is beyond individual capacity. Provision of these facilities in the study institutions where they are lacking will bring evenly distributed development and learning activities, attract potential students in an educational institution.

Considering the above, this study deems it right to suggest that the establishment of facility management unit within the Nnamdi Azikiwe University, Awka Anambra State Nigeria will go a long way in ensuring efficiency in the general maintenance of facilities. It also will introduce Total Cost Management that takes cognizance of initial capital costs (cost estimation) replacement/renewal costs (cost budgeting) and running/maintenance costs (cost control). These costs are projected at the sketch plan and design stage.

REFERENCES

[1] Achoru,A.M. (2015). Effective facilities management through management information system: a case study of Industry Training Fund building Abuja, *Research Journal's Journal of Technology Management. 2(1) 3-9.*

[2] Adeboyeje, R.A. (1994). *Management of school facilities*. Ibadan: Fountain Publisher.

[3] Adedeji, B. (1998). *Surveyors tackle facility management in Kano*. Tell No 13 March 30 P.T. 1.

[4] Adegbemile, O. (1998). *surveyors tackle facility management in Kano*. Tell No 13 March 30 P.T. 2.

[5] Adegbenjo, A. (1998). Cost and value considerations in facility management. *28th NIESV Annual Conference Paper, Kano.*

[6] Ajator, U.I. (2012). *Total cost management infrastructural projects*. Enugu, Nigeria: Ezu Book's Ltd.

[7] Ajator, U.O. (2001). Funding of school's rehabilitation projects for improved space utilization.
University World Journal, 1, 109-119.

[8] Ajator, U.O. (2012). *Total cost management infrastructural projects.* Enugu, Nigeria; Ezu Book's Ltd.

[9] Akingboungbe , D.O. (2000). The Practice and problems of building maintenance in Nigeria. The basic issues; *Journal of Environmental Technology*. Vol No 1 and 2 School of Environmental Technology FUTA Akure.

[10] Akinjiola, R. A. (1996). The University Equipment Maintenance and Development Centres (EMDCS), Situation Report. *Proceedings of the Meeting of the Head of Centres and Technical Co-ordinators.* Abuja, Nigeria; NUC Publication 2- 4.

[11] Akomolede, K. (1998). *Surveyors Tackle Facility Management in Kano*. Tell No 13 March 30 P.T. 4.

[12] Akpan E.O. P. (1996). *Project forecasting models*: *An over view in quantity surveyor*. Vol 21, January and March 16 -21, Lagos Nigeria.

[13] Alexander, K. (1996). *Facilities management*. Spon Press Publishers London.

[14] Amirize, B. (1999). School plant management and maintenance. *Journal of Educational Policy and Administration, 1 (1), 112-117.*

[15] Atkin, B. and Brooks (2009). *Total facilities management*. Third edition Oxford: Blackwell Science.

[16] Bagshaw, K.B. and Peter, G.T.(2015). Facility management and organisational effectiveness of manufacturing firms in Rivers State Nigeria. *Eurpean Journal of Business and Management, 7(26), 147-156.*

[17] Barret,P.S. and Baldry (2003). *Facilities management towards best practice*. Second Edition Oxford: Blackwell Science.

[18] Blessing,O., Richard J., Emmanuel, A., Adetokunbo, I., Emeka, M., Mahdavi, A., and Alias, A,B. (2015). Assessment of building maintenance management practices of higher education institutions in Niger State Nigeria. *Journal of design and built environment,* 15(c).

[19] Burt, N. (2012). Facilities management: good practice guide. *Journal Of Facility Management Association Australia. 1. 2-7*

[20] Chitipanich, S. (2004). Positioning facility management. *Facilities 22(13/14), 346-372*.

[21] Cotts, G. D. (1999). *The facility management handbook*. New York: American Management Association.

[22] Dell, O.(2008). Corporate strategies for facilities management. Benin: Barlor Publisher.

[23] Department of Environment,(1972). Building maintenance: *The Report of the Committee in R and D Bulletin,* HMSO, Britain.

[24] Enaohwo, I.O. and Obasi, F.N. (2000). Physical facilities and their utilization in public and private secondary schools. *West Africa Journal of Educational Research, (WA3ER) 3(1), 77-82.*

[25] Facilities Management, (1987). Planned maintenance for building services. *Journal of Facilities Management*. Editorial, October 5. Britain, 9-13.

[26] Fatoki, S. (1998). Relationship between property management and facility management. 28th *NIESV Annual Conference Paper Kano*.

[27] Fedipe, I.O. (1998) *Modern strategies of school plant maintenance.*

[28] Green, A. and Price, I. (2000). Whither FM a Delphi study of the profession and the industry. *Facilities,* 18 (7/8) 281 – 293.

[29] Grimshaw, R.W. (2003). FM: The professional interface. *Facilities,* 21(3/4) 50–57.

[30] Holmes, R. (1994). *Built asset management practice*, Spedding A. (Ed). CIOB Hand Book Of Facilities Management Longman Group Ltd137-154.

[31] Imanah, H.I. (1996). Management and Financing Equipment Maintenance Centre. *Proceedings of the meeting of the head of centres and technical coordinators federal universities on universities equipment maintenance.* Abuja, Nigeria; NUC Publication, 53-58.

[32] International Facilities Management Association (2002). *What is facility management.* Retrieved from the internet<URL Htt/www:ifma.org./whatsfm/index C.F.M. on February, 2021.

[33] Lee, R. (1976). *Building maintenance management*, Granade Publication, Britain; 2nd Edition.

[34] Longe Commission, (1990). *Report on the review of higher education development in Nigeria, gov.* Printing Press Lagos.

[35] Mbipom, G. (2000). *Educational administration and planning*. Nigeria: University of Calabar Press.

[36] McShane, S. L., and Von Glinow, M. (2003). *Emerging realities for the workplace revolution,* second edition, McGraw-Hill, New York.

[37] National policy on education, (2008). *Federal republic of Nigeria*. Abuja: Nerd Press.

[38] Nnabuo, P.O.M. (1997). The level of secondary school plant provision, utilization and maintenance in Nigeria. *West Africa Journal of Educational Research, (WAJEFO) 1(2), 163-166.*

[39] Nutt, P.C. (2002). Making strategic choices. *Journal of Management Studies*, 39(1), 67-96.

[40] Nwagwu, N.A. (1978). *Primary school administration*. Lagos Macmillian Nigerian Publisher.

[41] Odiete, D.E (1998). "Application of facilities management in the nigeria private and public sectors". 28th Annual Conference on *"Facilities Management in Nigeria the Estate Surveyor and Valuer's Perspective*". April, Royal Tropicana Hotel, Kano.

[42] Ogbodo, C.M. (1995). *Managing educational facilities in school, in V.F. Perertomode (ed): Introduction to educational administration planning and supervision*. Ikeja, Nigeria: Joja Educational and Publishers pp.44-55.

[43] Ojo, P.K (2002.). Property management and facilities management: Any difference? *Being a Seminar Paper organized by The Lagos State Branch of the NIESV* on 4th September 2002 at Federal Palace Hotel, Lagos.

[44] Okafor, B.N. & Onuoha, D.C. (2013) Facility management in educational institution. *Journal of Resources Development and Management*. Vol. 22

[45] Oladapo, M. A. (1997). Facilities management and maintenance programme: *Presidential Key Note Address NIQS Conference* held at Unilag conference Akoka Lagos 10th -11th September 1997.

[46] Olaniyonu S.O..A and Gbenu, J.P. (2007). *School plant planning and maintenance*. Ibadan: Olu Akin publisher

[47] Olayonwa, G.O. (2000). Property management*: principles and practices*. Debo publishing company, Iwo Ogun State.

[48] Owen, D (1993). *Facilities management*: *What Chartered Surveyors Need to Know*. Chartered Surveyor Monthly, Vol. II, Issue 9 June.

[49] Owen, D (1995.). Facility management is not Just a radio station. *Chartered Surveyor Monthly. Supplement* June II–IV.

[50] Park, A. (1998). *Facilities management: An Explanation.* London*:* Macmillan Press Ltd.

[51] Park. A. (1992). Facilities *for growth: In chartered quantity surveyor*. Feb, 17-19.

[52] Pickford, M. (1975). *University expansion and finance chaltor and windows limited*. Sussex University Press, London 89-112.

[53] Price, I. and Akhlaghi, F (1999). "The future of facilities management: Context, Research and Theory. *Facilities*, 17(5/6), 159-166.

[54] Price, I., Matzdorf, F., Smith, L. and Agahi, H. (2003). The impact of facilities on student choice of university. *Journal of Facilities, 21*(10), 212-222.

[55] Regterschot, J. (1998). *Facility management. P.19.*

[56] Rufai, A. (2003, July 10). "The imperatives for re-inventing NSITF" *The Guardian*, 20(8), 8.

[57] Samaila, I. (1985). *The influence of federal administrative trends in budgetary processes of Nigeria's federal universities.* Unpublished phD Dissertation of Texas Southern University USA.

[58] Sani, A.M. (1998). Emergency trend in facility management. *28th NIESV annual conference paper, Kan, 1998.*

[59] Sleight, S. (2000). Information Technology: *A practical up-to-date with latest development in the world of Information Technology (I.T),* Dorling Kindersle.www.dk.com.

[60] Spedding A. (1994). *Documentation and cost effective management of property* .

[61] Spedding, A. (1999) facilities and business organisation. *In Nigeria Institute Of Quantity Surveyors Journal*, Vol 29, Oct and Dec 2-8. Lagos.

[62] Torkildsen, G. (1992) *Leisure Recreation Management* 3rd Ed. London: E & FN Spon.

[63] Uniben, (1993). Master plan university of benin. Uniben printing press benin city, Nigeria.

[64] Uniplan consortium, (1980). *University of Nigeria masterplan executive summary*. Enugu Nigeria.

[65] Wahabi, K. A. (1987). An approach to building maintenance management. *Journal of Estate Surveyors and Valuers.* 11 (2), 42-53.

[66] White E.T. (1986). Post occupancy evaluation, *In CEFP Journal of November-December 19-22.*

[67] Zubairu, S.N. (2010). *The national building maintenance policy for Nigeria*: *The Architects'*

Perspective (2010), Abuja: Architects Colloquium.