

## Assessment of Factors Affecting Maintenance Practice in Adamawa State Science and Technical Colleges

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### ABSTRACT

*The main purpose of this study was to investigate the factors affecting maintenance practice in Adamawa State science and technical colleges. Two research questions were posed to guide the study and a null hypothesis formulated and tested. Survey research design was adopted for the study. The study was carried out in Adamawa State with a population of 116 respondents. The population was manageable. Hence, there was no sampling and sampling techniques. A 20-item structured questionnaire developed by the researchers was used for data collection. The instrument was validated by three experts and reliability of coefficient of 0.83 was obtained using Cronbach Alpha. The coefficient indicated high internal consistency of the instrument. Data for this study were analyzed using mean and standard deviation to answer research questions whereby a mean cut-off point of 3.50 was used for decision making. The research hypothesis was tested using z-Test at 0.05 level of significance. Result of data analysis found that strategies such as: provision of funds by school administrators, routine feasibility studies, setting up of committee to plan and implement maintenance policies in the colleges can improve maintenance practice. Maintenance personnel, poor attitude and unavailability of spare parts of the machines in workshops are major factors militating against effective implementation of maintenance practice. Upon the findings of the study, it is therefore recommended that teachers and college administrators should adopt modern strategies in order to ensure effective implementation of maintenance practice measures in Adamawa State Science and Technical Colleges.*

**Keywords:** Maintenance, Factors, Adamawa State, Technical Colleges

### INTRODUCTION

Maintenance is an issue of great concern to whoever that has the responsibility for providing funds for procurement or provision of capital assets both at public and private sectors, especially with the present state of the nation's economy. <sup>(1)</sup> defined maintenance as combination of factors undertaken to retain or restore an item to an acceptable condition. Also, <sup>(2)</sup> defined maintenance as the care given to equipment, tools, building and other facilities so that they would be operating in good working condition. Stressing the importance of maintenance, <sup>(3)</sup> viewed maintenance as the good working condition, which may extend the life span of facilities and equipment. Maintenance practice can be defined as work undertaken to keep, and improve any part of a facility and its services to an acceptable standard and sustainability and value of the equipment <sup>(4)</sup>. <sup>(5)</sup> observed that maintenance forms a crucial aspect of human and non-human resources development. It is considered as one of the great catalysts for the continuous existence of all forms of resources in the universe. A good maintenance practice ensures that facilities function properly even without

eliminating depreciation <sup>(6)</sup>. There are however, inevitable breakdowns which may occur usually as a result of alteration in the original component due to; age, continuous usage, wear, tear and stress. The life span and reliability of most modern tools and equipment is largely determined by the type and frequency of maintenance practice carried out <sup>(7)</sup>. It is significant to add that, little money spent on preventive maintenance while equipment is still functioning will be a safety measure for the machine that will protect it from total damage or it breakdown.

Maintenance plays a major role in the performance of technical college's infrastructural facilities. There is an array of abandoned and epileptic functioning facilities in public infrastructures in Nigeria and this is attributed to poor or lack of maintenance <sup>(8)</sup>. Maintenance also preserves the physical conditions of the buildings and supporting infrastructure in an operational state at all times. These standards can be achieved by adopting maintenance practices especially in public technical colleges in our communities which at present are lacking. Maintenance practice provides students with example of effective management principles at work, and teachers will be able to teach for long period without being bored. Although the Adamawa State Government has made very significant contributions towards public schools construction, furnishing and management in recent years through the Ministry of Education, but valuable facilities have been damaged and many properties have been lost in colleges; ranging from collapsed buildings, faulty machines and equipment among others. This is perhaps due to poor maintenance practice which has lead to physical deterioration in the college's infrastructural facilities such as; leaking roofs, broken-down machines/equipment, peeling and cracked walls among others. This situation makes the college's environment unsafe for teaching and learning. <sup>(9)</sup> buttressed that lives and properties will continue to be affected or even lost if the situation of maintenance is left unattended to at technical colleges.

The most fundamental problem in maintenance practice is a lack of policy guidelines for infrastructural development in colleges. It is unfortunate that in some science and technical colleges, facilities such as classrooms, staff offices, laboratories, workshops, libraries, study areas, equipment and tools are not routinely checked and serviced <sup>(9)</sup>. This situation arises because the State Governments have failed to establish policy directives on stringent maintenance practices about college's facilities. It is observed that some colleges hold classes under dilapidated buildings where students are exposed to harsh weather conditions and practical with machines, equipment and tools in bad conditions <sup>(10)</sup>. While private colleges have well-equipped laboratories, workshops and other equipment for effective teaching and learning, the public once are left with none or better off unsafe facilities. It is therefore, imperative that the different levels of government should address the issue of development and implementation of minimum standards for equipment development and management <sup>(10)</sup>. College managers lack qualitative and quantitative information on effective maintenance practice. Quantitative data according to <sup>(11)</sup> involves nature and condition of existing facilities, nature of present use and possible future use. Qualitative data involves room configuration, ventilation systems, windows, lighting, and access to

support facilities, the condition of furniture, and space for equipment including specific discipline related requirements. Data collected and analysed should form the bases for facilities management decision making.

Most of the third world countries depend on the government for the financing of education just like the other sectors of the economy. Consequently, a national budget which is based on the lean government coffers is shared among them. This to a great extent does not ensure adequate funding of the education industry. Beside financial constraints in the maintenance of college facilities are the lack of skill and qualified personnel for the maintenance of these facilities. With the introduction of the 6-3-3-4 educational system and its high technological and scientific implications, sophisticated technological equipments were massively imported for the implementation of the new program. Even though this is a step in the right direction, personnel were not trained to operate and maintained the equipment <sup>(121)</sup>. The quality of college facilities and environment shapes the attitude of the students, teachers, and other supportive staff. However, many college facilities throughout Nigeria face general mismanagement and social turmoil <sup>(131)</sup>. A successful management of college infrastructural facilities is a necessary and essential investment that would increase the quality of the overall educational performance and future outcomes <sup>(141)</sup>. An academically successful college must radiate a sense of well-being of its facilities, which reflect information for positive results. This will lead to effective restoration achieved through a good design that addresses educational needs of the students. College physical facilities management according to <sup>(151)</sup> involves maintenance of every single thing within the college premises.

Management of college facilities entails good leadership, effective monitoring of both the users and the facilities itself; applying proactive maintenance practices of those facilities and other things required for the college plant to give maximum services <sup>(161)</sup>. Maintenance practice of any college speaks much about such an institution. According to <sup>(161)</sup> the general appearance of school facilities constitute the basis upon which members of the public pass their judgments about the academic achievement going on in the school. The present economic recession being experienced world over has made it absolute imperative that the message of maintenance practice be taught very loudly in our education industry. Having identified the economic rationale of modernization, a relevant programme of maintenance and physical facilities renewal is critical and priority for maintenance is essential because unattended deterioration and neglect of college physical facilities could lead to higher outlays in the form of replacement lost. Science and Technical Colleges cannot afford this period of economic hardship; hence an effective maintenance practice needs to be adopted. Besides, maintenance enables us to pay less now, instead of waiting to pay more at a delayed point in time in the future. It has been observed that science and technical colleges in Adamawa State face challenges in the maintenance of facilities such as toilet systems, decent source of drinking water, laboratories, workshop equipment/machines, healthcare facilities, Information and Communication Technology (ICT) facilities such as projectors, computers, printers, scanners among others. It is also observed that most of the science and technical colleges in Adamawa State, Nigeria lack reliable data on physical facilities state

or conditions. Supporting this observation <sup>(17)</sup> buttressed that little information exist about college facilities in Nigeria particularly in Adamawa State. She further states that there are no records on college facilities maintenance particularly at the State Government institutions.

## **PURPOSE OF THE STUDY**

The main purpose of this study was to investigate the factors affecting maintenance practice in Adamawa State Science and Technical Colleges. Specifically the study sought to identify:

1. Factors militating against the effective implementation of general maintenance practice in Adamawa State Science and Technical Colleges,
2. Strategies adopted by school administrators and teachers for improving maintenance practice in Adamawa State Science and Technical Colleges.

## **RESEARCH QUESTIONS**

1. What are the major factors militating against the effective implementation of general maintenance practice in Adamawa State Science and Technical Colleges?
2. What are the strategies adopted by teachers and school administrators for improving maintenance practice in Adamawa State Science and Technical Colleges?

## **HYPOTHESES**

One null hypothesis was formulated and tested at 0.05 level of significance.

**H<sub>0</sub>:** There is no significant difference between the mean responses of teachers and school administrators on the major factors militating against the effective implementation of general maintenance practice in Adamawa State Science and Technical Colleges.

## **METHODOLOGY**

The study was carried out in Adamawa State which is located in the North-East region of Nigeria, with a geographical coordinates of 9° 20' North, 12° 30' East and a land mass of about 36,917 km<sup>2</sup> (Adebayo, 1999). Survey research design was adopted for the study. The population of this study was 116 respondents made up of 91 teachers teaching in the three Government Science and Technical Colleges, 15 administrators of the colleges. The population for this study was manageable hence; there was no sampling and sampling technique in this study. The entire population was used as sample in the study. A 20-item structured questionnaire developed by the researchers titled "Factors Affecting Maintenance Practice in Adamawa State Science and Technical Colleges" (FAMPASSTC)" was used for data collection.

The instrument was validated by three experts in Technology Education Department, Modibbo Adama University of Technology, Yola. The instrument was trial tested using 5 teachers from a technical college that is not part of the sampled population. The data collected was analyzed using Cronbach Alpha Correlation Co-efficient which yielded 0.83. The coefficient indicated high internal consistency which proved that the instrument

was reliable to be used for the study. The data collected were analyzed using simple descriptive statistics of mean and standard deviation to answer research questions whereby a mean cut-off point of 3.50 was used for decision making. Any mean score of 3.50 and above was agreed upon while any mean score below 3.50 was disagreed upon. The research hypothesis was tested using z-Test at 0.05 level of significance.

## RESULTS

### Research question 1

What are the major factors militating against the effective implementation of general maintenance practice in Adamawa State Science and Technical Colleges?

**Table 1: Mean Rating and Standard Deviations of Respondent's Responses on Major Factors Militating against the Effective Implementation of Maintenance Practice in Adamawa State Science and Technical Colleges**

| S/N               | Items  | $N_1=91, N_2=15$ | $\bar{X}_1$ | $\bar{X}_2$ | $\bar{X}_G$ | $\sigma$    | REMARK           |
|-------------------|--|------------------|-------------|-------------|-------------|-------------|------------------|
| 1                 | Maintenance personnel are not available for maintenance of equipment in the college laboratories.                          |                  | 3.41        | 2.98        | 3.35        | 0.44        | Disagreed        |
| 2                 | Insufficient funds for maintenance purposes and purchase of necessary supplies in the colleges                             |                  | 3.12        | 3.11        | 3.13        | 0.32        | Disagreed        |
| 3                 | Workshops are not organized for staff on general maintenance practices in the colleges                                     |                  | 3.20        | 3.44        | 3.26        | 0.36        | Disagreed        |
| 4                 | Insufficient equipment for carrying out maintenance work in the colleges.  |                  | 3.82        | 3.42        | 3.76        | 0.50        | Agreed           |
| 5                 | Machine and equipment are not regularly maintained in college workshops/laboratories.                                      |                  | 3.57        | 3.04        | 3.49        | 0.40        | Disagreed        |
| 6                 | There is low morale due to inadequate incentive for maintenance personnel in the colleges                                  |                  | 3.11        | 3.27        | 3.15        | 0.29        | Disagreed        |
| 7                 | Poor attitude towards maintenance practice by the teachers of the colleges   |                  | 3.57        | 3.20        | 3.52        | 0.45        | Agreed           |
| 8                 | Unavailability of spare parts for maintenance of the machine in the college workshops.                                     |                  | 3.57        | 3.38        | 3.55        | 0.42        | Agreed           |
| 9                 | Lack of orientation of students on the need to take maintenance issues with all the seriousness it deserves in the college |                  | 3.48        | 2.96        | 3.54        | 0.41        | Agreed           |
| 10                | Lack of official maintenance policy document to regulate the conduct of the managers of the colleges                       |                  | 2.96        | 3.00        | 2.98        | 0.34        | Disagreed        |
|                   |  |                  | <b>3.38</b> | <b>3.18</b> | <b>3.46</b> | <b>0.29</b> | <b>Disagreed</b> |
| <b>Grand mean</b> |  |                  |             |             |             |             |                  |

Key:  $\bar{X}_1$  = mean rating of teachers,  $\bar{X}_2$  = mean rating of administrators,  $\bar{X}_G$  = Item mean,  $\sigma$  = standard deviation

Table 1 showed the summary of the result for research question one which reveals that both the college administrators and teachers agreed on the three items (4, 7, 8, and 9) as major factors militating against the effective implementation of general maintenance

**Assessment of Factors Affecting Maintenance Practice in Adamawa State Science and Technical Colleges**

practice. It can be deduced that the other six items which had mean responses less than the 3.50 cut-off point were not accepted as major factors. The standard deviation of below 1.00 for all responses from the individual groups of respondents indicates that the responses were closely unanimous. The grand mean of the two groups shows a mean of 3.36. Based on the data presented and the subsequent analysis, the respondents showed agreement on the major factors militating against the effective implementation of general maintenance practice in Adamawa State Science and Technical Colleges. Some of those militating factors are; lack of maintenance personnel; lack of fund for maintenance and there is proper orientation of students on maintenance issues.

**Research question 2**

What are the strategies to be adopted by school administrators and teachers for improving maintenance practice in Adamawa State Science and Technical Colleges?

**Table 2: Mean Ratings and Standard Deviations of responses of Teachers and Schools Administrators on the Strategies for Improving Maintenance Practice in Adamawa State Science and Technical Colleges**

| S/N | Items  | $N_1=91, N_2=15$ | $\bar{X}_1$ | $\bar{X}_2$ | $\bar{X}_G$ | $\sigma$    | REMARK        |
|-----|--|------------------|-------------|-------------|-------------|-------------|---------------|
| 11  | Proper documentation which spells out maintenance practice that colleges adhere to.  |                  | 3.52        | 4.42        | 3.97        | 0.41        | Agreed        |
| 12  | Provision of funds for adequate maintenance of facilities.   |                  | 4.70        | 4.36        | 4.65        | 0.48        | Agreed        |
| 13  | Setting-up committees to plan and implement maintenance policies in the school.  |                  | 3.67        | 3.40        | 3.64        | 0.46        | Agreed        |
| 14  | Stringent rules mandating heads of department /unit to keep inventories of routine maintenance activities in the colleges. |                  | 3.25        | 3.44        | 3.29        | 0.37        | Disagreed     |
| 15  | Carrying out routine feasibility studies on college facilities   |                  | 4.51        | 4.64        | 4.55        | 0.41        | Agreed        |
| 16  | Provision of funds for the replacement and repair of broken and worn out facilities or its parts in the workshop.          |                  | 2.64        | 3.73        | 2.84        | 0.24        | Disagreed     |
| 17  | Ensuring the materials in the workshop are stored according to their characteristics.                                      |                  | 3.57        | 3.64        | 3.59        | 0.39        | Agreed        |
| 18  | The school administrators should provide adequate accommodation for student.   |                  | 2.47        | 3.58        | 2.67        | 0.19        | Disagreed     |
| 19  | Frequent general supervision of college facilities.  |                  | 3.15        | 3.31        | 3.19        | 0.30        | Disagreed     |
| 20  | Routine inspection of accommodation facilities for maintained  |                  | 3.23        | 3.51        | 3.29        | 0.31        | Disagreed     |
|     | <b>Grand mean</b>  |                  | <b>3.26</b> | <b>3.50</b> | <b>3.57</b> | <b>0.32</b> | <b>Agreed</b> |

Key:  $\bar{X}_1$  = mean rating of teachers,  $\bar{X}_2$  = mean rating of administrators,  $\bar{X}_G$  = Item mean,  $\sigma$  = standard deviation

The result in table 2 above revealed that five items (11, 12, 13, 15, 17) were agreed upon by

teachers and college administrators as strategies to be adopted for improving maintenance practice in Adamawa State Science and Technical Colleges. Whereas, five other items from the ten suggested were disagreed upon as strategies to be adopted for improving maintenance practice. The standard deviation of two groups of the respondents showed close but different ranges with each having a standard deviation below 0.48 which indicates that the responses of the respondents were closely related to each other. Since the grand mean of both responses is 3.57, which is above the decision cut-off points, it means that the suggested strategies are good for improving maintenance practices. Some of these strategies includes; keeping of inventory of maintenance activities; a committee to implement maintenance policies and provision of funds for maintenance activities.

### Hypothesis 1

There is no significant difference in the mean of responses of teachers and school administrators on the major factors militating against the effective implementation of maintenance practice used in Adamawa State Science and Technical Colleges.

**Table 3: z-Test Analysis of Difference between Opinion of Teachers and Administrators on General Maintenance Practice**

| Respondents    | N   | $\bar{X}$ | S <sup>2</sup> | z-cal | z-crit | Remarks  |
|----------------|-----|-----------|----------------|-------|--------|----------|
| Teachers       | 220 | 3.38      | 0.07           |       |        |          |
| Administrators | 45  | 3.18      | 0.04           | 1.95  | 1.96   | Accepted |
| Total          | 265 |           |                |       |        |          |

$P < 0.05$ , N=numbers of respondents,  $\bar{x}$  mean, SD=standard deviation, z-calculated value z- critical value.

Table 3 above revealed that z-cal is 1.95 and is less than the z-crit of 1.96 at 0.05 level of significance. Hence, the null hypothesis was accepted indicating that there is no significant difference between the mean responses of teachers and school administrators on general maintenance practice used in Adamawa State Science and Technical Colleges.

## DISCUSSION

Findings of the study revealed that, insufficient equipment for carrying out maintenance work in the schools and colleges, lack of maintenance personnel, poor attitude towards maintenance practices and unavailability of spare parts for maintenance of the machines in workshops, lack of official maintenance policy documents are major factors militating against the effective implementation of general maintenance practice in Adamawa state secondary schools and technical colleges. This finding is in consonance with findings of <sup>[10]</sup> who found out that some lessons hold under trees and dilapidated buildings where students are exposed to harsh weather conditions. He also found out that while some classes have well-equipped laboratories, workshops and other equipment for effective teaching and learning of technical skills, in his work repositioning the Nigerian teaching and learning of Technical and Vocational Education and Training. This study is also in line with the study of <sup>[8]</sup> which identifies stakeholder's perception of their role in the programme for effective

maintenance of workshops facilities in technical colleges in Adamawa state of Nigeria. The study revealed that lack of the provision of the adequate fund and poor organizational structures among others are responsible for poor maintenance of facilities.

The result of the study revealed that, provision of funds by school administrators, routine feasibility studies, setting up of committee to plan and implement maintenance policies in the colleges were identified for the improvement of maintenance practice in Adamawa State Science and Technical Colleges. This finding is in agreement with <sup>(15)</sup> who asserted that improving maintenance practice involves keeping equipment and mechanized infrastructure in operational conditions for continual use. In addition <sup>(9)</sup> buttressed that for improved strategies of maintenance practice, it means preserving and keeping in good order as near as possible in their original state. Maintenance practice therefore provides students with example of effective management principle at the work; and teachers will be able to teach for a long period without being bored. The study revealed that there is no significant difference between the mean responses of teachers and school administrators on the major factors militating against the effective implementation of general maintenance practice used in Adamawa state secondary schools and technical colleges. This is in line with findings of <sup>(17)</sup> who found out that lack of incentives as the major factors militating against effective maintenance of electrical/electronic workshop equipment in technical colleges in North-Eastern State. This is also in consonance with the findings of <sup>(2)</sup> who found out that the view of principals and teachers did not differ significantly concerning the strategies of equipment maintenance.

## **CONCLUSION AND RECOMMENDATIONS**

Based on findings of the study, it is concluded that there numerous factors both major and minor militating against the effective maintenance practice in Adamawa State Science and Technical Colleges. Insufficient equipment for carrying out maintenance work in the schools and colleges, teachers have poor altitude towards maintenance practices and unavailability of spare parts for maintenance of the machines in workshops, lack of official maintenance policy documents, are identified as major factors militating against effective implementation of general maintenance practice in Adamawa State Science and Technical Colleges. Strategies such as: provision of funds by school administrators, routine feasibility studies, setting up of committee to plan and implement maintenance policies in the schools were identified for the improvement of maintenance practice in Adamawa State Science and Technical Colleges. Maintenance personnel, poor attitude and unavailability of spare parts of the machines in workshops are major factors militating against effective implementation of maintenance practice in Adamawa State Science and Technical Colleges. Upon the findings of the study, the following recommendations are made:

1. The Ministry of Education and other relevant stakeholders should put measures in place to eliminate factors militating against maintenance practices in Adamawa State Science and Technical Colleges.



2. Teachers and college administrators should adopt modern strategies in order to ensure effective implementation of maintenance practice measures in Adamawa State Science and Technical Colleges.

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**Assessment of Factors Affecting Maintenance Practice in Adamawa State  
Science and Technical Colleges**

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