

Mechanism for Effective Maintenance of Public Building for Sustainability - A Case Study of Kabiru Umar Hostel, Modibbo Adamawa University of Technology Yola, Adamawa State Nigeria

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Abstract

Public Building suffers from deterioration due to poor or lack of adequate maintenance. This study therefore finds out the most appropriate mechanism to be adopted for effective maintenance of public buildings. Problems associated with the maintenance of Kabiru Umar Hostel and the responses of the maintenance department towards detected defects were also investigated. A two sectioned questionnaire was administered to both hostel users and the maintenance personnel, a total of 130 questionnaires was randomly distributed to the maintenance staff and students: Thirty (30) questionnaires to maintenance staff while one hundred (100) questionnaires to students users, respectively, and the result was analyzed using simple percentages. The findings revealed that the maintenance department lack professionals, adequate materials/equipment, maintenance, fund as well as proper supervision. The department does not immediately respond to detected defects and the best mechanism for effective maintenance was found to be the preventive maintenance method. It was hence concluded that, the maintenance personnel were underused at the expense of the students. Even with the available resources, no effort is made to help out the condition of hostel users by the department. Lastly, it was recommended that hostel maintenance fee paid by the students should be used appropriately in purchasing materials/equipment needed for the maintenance job. For effective use of the maintenance personnel, adequate funds should be provided to the department. Preventive maintenance should be used so that defects could be detected early and proper remedial measures should be taken to avoid further deterioration that would involve high cost. Staff should be given the opportunities of further studies to upgrade their professional skills to meet the modern technologies in their profession. Finally renovation should be carried out at intervals of four to five years to maintain the aesthetic value and good usage of the building and should be cleaned on a daily bases to reduce health hazard on the students.

Keywords: Maintenance; Public Building; Sustainability; Mechanism

Introduction

The role of maintenance in the sustenance of a healthy building life as well as environment can never be overemphasized. Yet maintenance has always been treated with neglect, despite its indispensable role in keeping the structure in a state of comfort for its occupants. It is noted that neglect of maintenance has a cumulative result with rapidly increasing deterioration of fabric and finishes of a building accompanied by harmful effects of the content and occupants, it is a known fact that every living environment requires proper maintenance for it to be tagged “nice” (Seeley, 2012). Hence, effective building maintenance requires the correct diagnoses of defect and implementation of proper remedial mechanisms. Unfortunately, the state of hostel maintenance for the comfort and safety of both the buildings and its occupants in Modibbo

Adama University of Technology, MAUTECH, Yola, is far from being good. Taking a close look at the Kabiru Umar hostel structure at MAUTECH, one could notice a lot of maintenance problems on the existing structures such as: damaged louver and doors, deteriorated ceilings, cracks on the walls, leakages on the roof, dirty toilets etc.

Therefore, it is in an attempt to ensure proper and adequate maintenance that this study sets out to investigate appropriate mechanism for maintenance of school buildings with reference to Kabiru Umar hostel MAUTECH – Yola. It is visualized that, the lack of hostel maintenance prones the students to health hazards and the entire structure to failure due to deterioration. Hence, the study seeks to find out particularly the problems associated with maintenance practices in school buildings, the

response of the relevant authority towards detecting defects on the hostels, the effect of financial constraints on the hostel maintenance and the maintenance mechanism used.

Pertinent to mention here is that with the result of this study, maintenance officials will be aware or be enlightened on the mechanism to be adopted for effective school building maintenance, while the students will be saved from health hazard and the school would achieve efficiency and economy of its buildings. The study has been restricted to mechanism for maintenance of Kabiru Umar hostel at MAUTECH – Yola as a case study.

Maintenance can be defined as a combination of any actions carried out to retain an item in, or restore it to an acceptable condition (Sote, 2003). Olowokere, (2002) viewed maintenance as a process of programmed activities designed to ensure or maintain the integrity of a device or facility. According to British Standard (BS):3811 (1984), maintenance refers to work undertaken in order to keep, restore and improve every facility in service and to sustain the utility and value of the facility to a currently acceptable standard. However, the approach in defining maintenance, the fact remains that, it reduces the possibilities of failure.

According to Chan (2014), the aim of building maintenance is to preserve the building in its initial effective state and this must be started from building maintenance at organizational strategic level. If the completed building facilities are not managed and maintained properly, they cannot

perform as intended. Therefore, building maintenance and refreshment are required to upkeep the facilities in best operation conditions. There is a need to consider the facilities management and building maintenance strategies in advance, and it must be part of the core business decisions. Building facilities must always be maintained to an acceptable condition and every part of the facilities must be refurbished and/or upgraded to sustain its utilities and value according to the new building and environmental regulations.

Maintenance is defined by BS 3811, as ‘The combination of all technical and associated administrative actions intended to retain an asset in or bring it to a state in which it can perform its required function’. This implies that there are two processes to be considered, ‘retaining’, i.e. work carried out in anticipation of failure and ‘restoring’, i.e. work carried out after failure. The former is usually referred to as ‘preventive maintenance’ and the latter as ‘corrective maintenance’. The thrust of any maintenance strategy should generally be towards preventative rather than corrective maintenance; although there may be a ‘run to failure’ policy which may be appropriate in certain situations, for example, tap washers, general lighting service lamp, etc. For larger, more complex, and more important items of plant, machinery, structural elements and decor, a maintenance strategy must be established to work in harmony with and to support the core business corporate strategy.

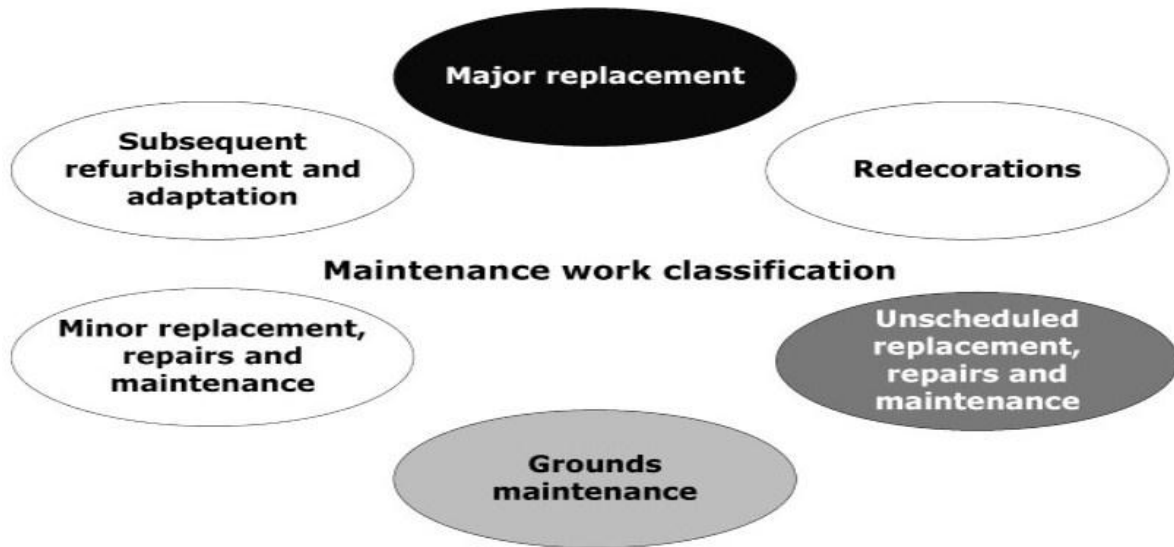


Figure 1: The six typical classifications of maintenance work (ISO 15686, 2008)

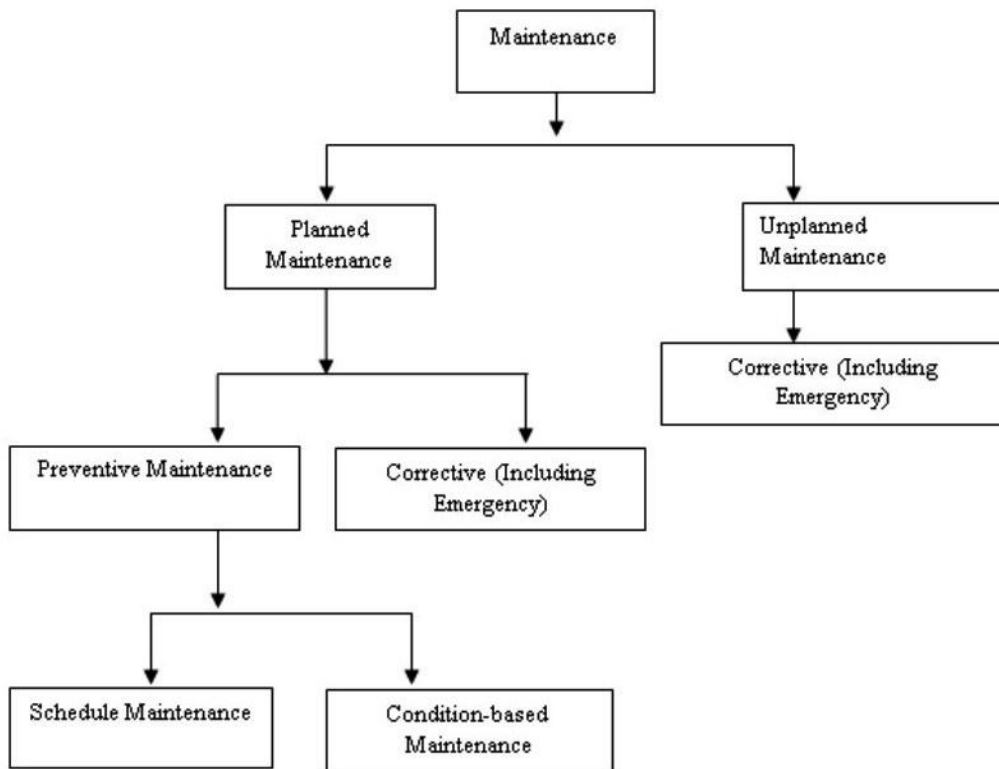


Figure 2: BS 3811³ categorises Building Maintenance by means of the following terms and definitions

Source: BS: 3811³ (1984)

BS 3811: (1984), sub-divided maintenance into two major types which are; planned and unplanned maintenance, respectively. Maintenance has three separate components; these are, servicing,

rectification and replacement. Servicing is essentially a cleaning operation undertaken at specific intervals of varying frequency and is sometimes tagged day-to-day maintenance.

Rectification usually occurs in the early life of the building and arises from short comings in design, inherent fault, or unsuitability of components, damage of goods in transits or installation and incorrect assembly. Replacement occurs as a result of conditions which causes material to decay or deteriorate at different rates, (Bulama, 2004).

Taiwo *et al.*, (2003), listed the following as the constituent parts that must be considered for effective and well planned maintenance.

- Instruction and Maintenance Manuals: This contains all the information necessary for installation, operating, maintaining, overhauling and starting of the equipment, to assist user in maintaining the performance of the facility.
- Inspection: this is usually in form of various walk around and visual checks, necessary to detect initial faults before facility breaks down.
- Record and Analysis: This is referring to standard record keeping techniques “which must be applied for the successful implementation of maintenance schedules”.
- Training of Maintenance personnel: It implies training of personnel at new and current level of professional skill to cope with preventive maintenance schedules

Oladeji (2004) mentioned some factors that play very important role in the quality and cost of maintenance such as: services life, design, competence, sophistication and quality of products. Mechanism of maintenance in the context of this study is referred to as maintenance methods adopted for effective maintenance program. Hence, Fuchs (1992) stated two methods of facility maintenance as follows;

Preventive Maintenance (Time based system) and predictive maintenance (condition – based system): According to him, preventive maintenance is a time based surveillance method in which periodic inspections are performed on a facility to determine the progress of wear in its components and sub-systems, while predictive maintenance is a condition based surveillance method that measures some output from the facility that is related to the degeneration of the component or sub-system.

Sustainability means getting what we want without compromising the effort of future generations to meet their own needs. These needs include; natural resources, in addition to social and economic resources. Sustainability is not concern only about the environment; included in most definitions of sustainability there is also concerns for social justice and economic development. In addition, Abidin (2010), confers that building professional practitioners should be mindful of sustainable construction practices so that they will be able to sufficiently decrease the adverse influences of their actions on the environment. Awareness and knowledge are the key factors to strengthen the sustainable movement in the construction industry.

Sustainable building is the design and construction of buildings using methods and materials that are resource efficient and that will not compromise the comfort of the environment or the associated health and wellbeing of the building’s occupants, construction workers, public or future generations. Sustainable building comprises the consideration of many issues, including land use, site impacts, indoor environment, energy and water use, lifecycle impacts of building materials, and solid waste (Sameh *et al.*, 2015).

According to Olaniyi *et al.* (2006)Buildings are structures where human resides for comfort, it can be either for educational purposes, institutional use, recreational, storage or residential and are the main physical assets of any nation; they are created for providing shelter and enhancing people’s quality of life. If these buildings are not maintained, they will become liabilities. In the United Kingdom, from the year 2002, half of all annual construction works were exclusively for building maintenance. Nevertheless, this is not the case in Nigeria, where there is poor maintenance culture and values. Public buildings in Nigeria have a record of poor performance operations, poor maintenance and mismanagement. In the past twenty years, the importance has been on the development of new properties, with little care paid to the maintenance of the existing structures and the future maintenance needs of the proposed ones.

Proper operation and maintenance are significant factors in built environment sustainability as the majority of carbon emissions of buildings are

formed during building occupation. (Aaltonen *et al.*, 2013) suggested that sustainable construction must evolve into life cycle sustainability of buildings integrating green building operation and maintenance. They also noted that Facility Management services hold a key part in reducing the total environmental impact of a corporation with their direct and indirect effect on building environmental performance metrics and the readily available data which is needed for green management.

When the maintainability of the building is ignored, it adds to the greatest environmental and social risks throughout the long period of a building, increasing its life cycle costs. It is found that understanding and provisioning for maintainability is more prominent to upcoming green building technologies as they are yet to undergo the effects of degradation and weathering (Chew *et al.*, 2005). It is believed that the built-environment must be sustained right along a building’s service life (De Silva, 2011).

The under listed are questions which this study would like to answer.

- i. What are the problems associated with maintenance of school buildings?
- ii. How prompt does it take the relevant authority to attend to any detected defect?
- iii. Which mechanism is the best for effective maintenance of school buildings?

Materials and Methods

The population for the study consisted for all confirmed staff of the maintenance department and all legal occupants of Kabiru Umar Hotel at MAUTECH, Yola.

The sample comprised of thirty (30) confirmed maintenance staff and one hundred (100) students allocated to Kabiru Umar hostel, selected through the Simple Random Sampling Techniques. The main instrument for data collection is questionnaire. The question items in the questionnaire were both structured and unstructured. The questionnaire items were in two sections; section A comprises of five items for the maintenance staff, while section B has five items for occupants of Kabiru Umar hostels. Out of thirty (30) questionnaires distributed to staff of maintenance department, 23 were retrieved, while seventy (70) out of one hundred (100) students were retrieved. The data were analyzed using simple percentage for the most convenient interpretation

Results

The results obtained from the respondents are on table 1 below:

Result of Data Collected From the Staff of Works Department.

Table 1: Problems Associated with Maintenance of Public Building

S/No	Option	Frequency	Percentage %
A	Lack of professionals	6	14.6
B	Lack of materials/equipments	8	19.5
C	Inadequate fund	5	12.9
D	Lack of supervision	6	14.6
E	All of the above	16	39
	Total	41	100

Source: Field Survey, 2017

Table 1, presents the result of the responses to problems associated with public building maintenance. Six (6) respondents represent 14.6 % indicate lack of professionals, eight (8) respondents represent 19.5% agree on lack of materials/equipment, five (5) respondents represent 12.9% agreed on inadequate fund, six(6)

respondents represent 14.6% agreed on lack of supervision, sixteen (16) respondents represent 39% agreed on lack of professionals, materials/equipment, lack of supervision and inadequate fund are the major problems associated with maintenance of public building.

Table 2: The Period It Takes the Authority to Attend To Any Detected Defects in Building.

S/No	Option	Frequency	Percentage %
A	Very long time	22	44
B	After two to three days	10	20
C	Immediately detected	7	14
D	I don't know	3	6
E	Two to three months	8	16
Total		50	100

Source Field Survey, 2017

Table 2, present information on how prompt it takes the relevant authority to attend to detected defects in building. The result indicated that twenty two (22) respondents representing 44% specified that it takes a very long period, 20% agreed with

two to three weeks, 14% specified immediately detected, 6% indicate they don't know and 16% agreed with two to three months. Hence, the result shows that defects are not given urgent attention.

Table 3: Mechanism Used for Effective Maintenance.

S/No	Option	Frequency	Percentage %
A	Preventive maintenance	26	52
B	Corrective maintenance	13	26
C	Emergency maintenance	14	8
D	Predictive maintenance	1	2
E	Scheduled maintenance	6	12
Total		50	100

Source: Field Survey, 2017

Table 3 represents responses on the mechanism that should be adopted for effective maintenance of school building. However, 26 respondents representing 52% preferred preventive maintenance, 26% agreed with corrective maintenance, 8% preferred emergence maintenance, 2% preferred predictive maintenance and 12% preferred scheduled maintenance.

Discussion

Tables 1, 2 and 3 reveal answers to the various research questions and have been extracted from the questionnaire items. However, Table 1 deal with research question one and it was revealed that 61.6% of respondents pointed at lack of professionals, inadequate fund, lack of materials/equipment and lack of supervision as the problems associated with school building maintenance. As a result there is a little or no maintenance of the school building at the Kabiru Umar hostel. The implication is that the students of the said hostels are prone to hazards of noxious gases from filthy toilets and broken plumbing installations, and the danger is eventual collapse of part or the entire structure due to continuous deterioration of the building.

Research question two was treated in Table 2, which reveals that 44% of respondents assert that defect cases reported to the maintenance department are not treated immediately. Hence, it takes an unpredictable time for the department to show concern, resulting in the students own effort to finding a little comfort for themselves. The implication is student's academic distraction, which will lead to psychological imbalance that may impede their performance academically.

Research question 3, was treated in Table 3 and the finding indicated that 52% of respondents were of the opinion that preventive maintenance was the best mechanism for effective school building maintenance. Preventive maintenance here, involves periodic inspections of buildings and detection and prevention of incipient failure. It therefore implies that for efficiency and economy of the school building authorities should adopt the mechanism of prevention rather than correction. Otherwise, the value of investment on the hostels would not be recovered.

Conclusion

Based on the findings of this study, it can be concluded that the maintenance department lack the necessary requirement for an excellent job; hence, the staff are underused at the expense of the students. Secondly, even with the available resources, the department does not react fast to cases of defects. Finally, the best mechanism for effective maintenance is preventive maintenance. It is therefore recommended that:

- 1) Hostel maintenance fee paid by the students should be used appropriately in purchasing materials/equipment needed for the maintenance job.
- 2) For effective use of the maintenance personnel, the management should provide adequate funds.
- 3) Preventive maintenance should be used so that defects could be detected early and proper remedial measures taken to avoid further deterioration that would involve high cost.
- 4) Staff should be given the opportunities of further studies to upgrade their professional skills to meet the modern technologies in the profession.
- 5) General renovation should be carried out at intervals of four to five years to maintain the aesthetic value of the building.
- 6) Hostel should be cleaned on a daily bases to reduce health hazard on the students.

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