STRATEGIC APPROACHES TO EFFECTIVE FACILITIES MANAGEMENT FOR TECHNOLOGICAL AND ECONOMIC DEVELOPMENT IN NIGERIA

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Abstract
The main objective of this research study is to have an in-dept analysis of facilities management strategies and causes of facilities deterioration in organizations with special emphasis and reference to the Nigerian environment and organizational system.

Keywords: Facilities management, maintenance, global best practices, technological and economic development.

INTRODUCTION
Nigeria as at today is still faced with the general absence of maintenance culture of various facilities. There is a very high neglect of our buildings, civil engineering works, equipment, electrical and mechanical plants in such a manner that calls for questioning and the taken of proactive measures to prevent both public and private infrastructure and equipment from deterioration, thereby falling into decay due to outright negligence. Alan Everett (1973) grouped causes of deterioration into direct and indirect means. Spedding (1999) defined facilities management as the practice of coordinating the physical workplace with the people and work of the organization, integrating the principles of business administration, architecture, behavioral and engineering.
functionality, comfort, safety, security and efficiency of the built environment by integrating people, place, processes, machines, equipment and technology in the most efficient and effective ways, in order to achieve organizational goals and objectives for the purpose of technological advancement and economic development of a nation. Facility management is the coordination of the physical work place with the people and work of an organization. It is the integration of business administration, architecture, behavioral and engineering sciences of organizations by the facilities managers, who are the routine operators in charge of maintenance and management of organizational facilities. This research tends to analyze the concepts of facilities management, maintenance, bases of facilities maintenance, the causes of facilities deterioration, facilities maintenance assessment, responsibilities of facilities managers, types of facilities maintenance which include; response or unplanned maintenance, programme or planned maintenance, cyclical maintenance, proactive maintenance, predictive maintenance and preventive maintenance. Possible global best practices on facilities management were recommended for adoption to ensure that facilities are properly taken care of, to eliminate the challenges of facilities deterioration in organizations.

sciences. The term facilities include; equipment, machines, buildings, grounds and utilities plants, which typically represent majority of an organization's capital asset. Facilities form the largest single class of asset on the balance sheet of organizations and today managers of industries and various establishments have a new awareness of the strategic opportunity presented by facilities management. A significant part of this opportunity is that, offered by effective facilities maintenance and their overall performance, which usually levels to the achievement of the organization's business goals. Smith (2003) averred that facilities are another major cost centre and in most cases, the second largest expenditure category regardless of whether space is owned or leased, ranking next to human resources. Facilities are not necessarily confined to buildings but preferably considered as infrastructure that supports people, either individually or collectively, to realize their goals. The philosophy of facilities management in any organization depends on the effective control of human and material resources for the accomplishment of set goals and objectives, namely teaching,
research, production, manufacturing and services. European and American industrial and commercial organizations have adopted Facilities Management as a strategic management instrument to improve the performance of facilities (Telfer, 2005). For the achievement of organizational goals and objectives, personnel charged with the handling and control of equipment must be adequately trained, well disciplined, result oriented, dependable and determined.

FACILITIES MANAGEMENT

The concept of facilities management was first given its identity in the United States of America. The America Library congress define facilities management as the practice of coordinating the physical work place with the people and the work of the organization, integrating the principles of business administration, architecture and behavioural and engineering sciences which agrees with the definition of the International Facilities Management Association (IFNA). Facilities Management is described as involving premises, policy formation of long range planning, space management, building maintenance, equipment maintenance, routine administration, control of manpower energy and related resources. It embraces complex and diverse range of disciplines such as estate management, architecture, construction, project management, building, capital services, engineering, human and resources management, environmental, psychology, interior design and management. Facilities management is an evolving profession, whose processes are influenced by the need to effectively and efficiently manage non-core services, charged with optimizing costs and improving the service levels in support of the core business as part of the drive to improve the organization’s competitiveness in the market place, facilities management is all about change. The organizational structure, corporate styles, technology, the workforce, buildings, skills and tasks as well as furniture have changed due to development and implementation of government programmes and policies geared towards innovation. There is also change towards globalization, in so many organizations exists virtual office and the virtual workers with remote attachment, made possible through information communication Technology. The principles and practice of facilities management, adequately reflect this dynamic process to key the organization into a high competitive advantage in the market place. Facilities management as it is practiced emphasizes the win-win approach to business. That is, to keep winning an organization must innovate, anticipate and adapt, while constantly improving it’s ability to meet the expectations of the customers, employees,
students, suppliers, investors and the society at large, through effective facilities maintenance practices.

MAINTENANCE
Maintenance is any action(s) carried out to retain an item in or restore it to acceptable condition. Maintenance is the act controlling the use that is exploitation, preserving the performance standards, qualities and life span of a property with a view of perpetuating its full capacity benefits. Maintenance is work undertaken in order to keep or restore every facility to acceptable standards. The British standard further explained that where there are statutory requirements for maintenance, the acceptable standard must be no less than that necessary to meet and maintain the standard. Maintenance in the factories Act 1961 has maintained an efficient state in working order and in good repair. Maintenance is described as work undertaken in order to keep, restore or improve every facility, that is every part of a building, its services, equipment and surroundings to a currently accepted standard and to sustain the utility and value of the facility. Looking at the definition, it is necessary to identify the key words such as work undertaken which is connected with skilled operation by skilled tradesmen, supervised and guided by a hierarchy of management levels. To keep and ensure that there is no depreciation of the original situation, maintaining status quo. To restore to a normal position, where a reduction in the original position is noticed, and get back to that original situation through repairs, replacement and refurbishing. To improve, it means the space can be expanded, the quality can be upgraded to reflect current changes in taste, health requirements, fashion, economic power and available technological known how. Deliberate substitution is also possible. Every facilities refers to the equipment elements, its components, styles, aesthetics the use there of, the amenities etc for example kitchen, toilets, sanitation, the landscape, privacy, adaptations etc. Currently accepted standard, in the light of existing knowledge previous solutions might be outdated and command less acceptability. The new facilities may attract higher rentals, though for example the addition of standby generator, a fast lift escape routes in case of accident, security measures, packing space, provision of canteen, clinics and other everyday activities e.t.c. To sustains refers to the actions taken to ensure that a status quo is maintained, incorporating devices which is only possible in newer developments to ensure retention of interest of current occupiers. The utility refers to the maximum use to which the facilities can be put. Value refers to a measure of purchasing power, rental passing, premium e.t.c. In line with the above explanations, which adequately
describe the meaning of maintenance in all its ramifications? Maintenance is seen partly as technical and partly managerial issues. The technical aspects will be looked into later but the managerial aspects include the functions of high – level management using the currently acceptable system and principles of management.

Maintenance work generally encompasses works done on a structure or a piece of equipment such as servicing, replacement, rectification, renovation and rehabilitation in order to restore every facility of the infrastructure or equipment to an acceptable standard and to allow such infrastructure or equipment to meet it’s expected life span, while performing its function as originally designed to perform, facilities such as equipment starts to deteriorate from the moment they are commissioned into use. Maintenance culture should be put in place in order to keep them in good conditions. Most facilities defeats are available in a short term if an adequate precaution has been made and the ethics of professionalism strictly followed by professionals. In most cases these defeats do not occur through lack of basic knowledge but through lack of putting the knowledge into practice, probably because of negligence.

THE BASES OF FACILITIES MAINTENANCE
There is no structure anywhere in the world, which is designed and constructed, that is free from deterioration so as to be maintenance free. Every facility will deteriorate either due to their usage or due to effluxion of time. This definitely will give rise to maintenance work. The bases of maintenance therefore are legal, socio-cultural and economic significance.

THE CAUSES OF FACILITIES DETERIORATION
All materials deteriorate and the function of the designer is to anticipate the changes which will occur in service. Alan Everett (1973) grouped causes of deterioration into direct and indirect which include: sunlight, corrosion of metals, biological agencies, water or moisture, crystallization of salts, frost, lost of volatiles, chemical action, vibration, heat or fire, abrasion and impact.

RESEARCH METHODOLOGY
The instrument used for data collection for this study were obtained from both primary and secondary sources. This study employs survey design approach. A simple random sampling technique was used with adequate representation of all elements of the population. The researchers selected some respondents from staff and occupants of some companies in some communities in Delta State,
Nigeria, as the sample for the study. The companies in these communities were specifically visited and observed. The primary sources were obtained from direct interview carried out on the staff and occupants of these companies, physical observation and structured questionnaire administered to targeted groups, to assess their level of awareness, knowledge and perception on facilities maintenance and management. The secondary data were obtained from documents, such as magazines, textbooks, academics journals, companies newsletters, newspapers and the internet, which contain information on facilities maintenance and management strategies. Oral interviews were administered to some respondents with a view of clarification and validation of data collected from secondary sources. Secondary data were subjected to qualitative analyses, where inferences and deduction were drawn to aid the discussions. Professional Engineers, who are experts and experienced in the field of facilities maintenance and management were also interviewed through structural questionnaire.

**DISCUSSION OF FINDINGS**

**FACILITIES MAINTENANCE ASSESSMENT**

Maintenance represents a growing portion by many facility budgets and for this reason the facilities manager should be able to provide answers to the following questions. Is the organization paying more for maintenance than it need to? Is the organization investing enough money in maintenance? What is the condition of the organization equipment or facilities? What percentage of maintenance is planned? Is the organization doing enough of the proper type of maintenance? Do records exist that document equipment or facilities maintenance history? It is important to bear in mind that an organization may be able to afford to purchase an asset only once, so it is wise to care for it properly Every facilities manager needs to set up an effective maintenance programme and establish appropriate maintenance procedures. These efforts should comprise regular inspection and such effective routine practices that will eliminate causes of facilities failure, prolong the life span of equipment or facilities, reduce the probability of costly major breakdowns, emergency repairs and lost of production, reduce operating cost, improve company image, decrease downtime, ensure safety, ensure smooth operation of equipment at peak efficiency, save energy and maintain warranties.

**THE RESPONSIBILITIES OF FACILITIES MANAGERS**

The facilities manager may be responsible for a wide range of management functions within his or her day to day role. The facilities manager essentially look
after all of the services that helps a business or other organization do its work in the most efficient and effective ways for best service delivery.

The major responsibilities of a facility manager, include;

- Ensuring that the facilities are operating as they should on a daily basis.
- Dealing with emergency issues that arises from facilities operations and maintenance.
- Formulating plans for the future.
- Creating plans for replacement and repairs of facilities.
- Developing and managing vendors contracts for facilities procurement.

Figure 1: Source: www.xenongroup.com.uk

Figure 2: Source: https://www.ifma.org
TYPES OF MAINTENANCE

There are different types of maintenance which are common to facilities, the two major activities of maintenance are response or unplanned maintenance and programmed or planned maintenance.

Response or Unplanned Maintenance:
This type of maintenance is known as remedial, corrective or curative maintenance. This types of maintenance is unplanned, it is usually carried out in response to a request from the users of the property or equipment. It is an activity performed on a non–routine basis and it is sometimes reconstructive in nature. The facility is operated until it breaks down. When there is a breakdown and a request is received, the response to the request will depend on a number of factors such as: The nature of the request, for example, whether the problem can be identified without a visit, the maintenance policy of the organization, the potential seriousness of the failure, the amount of funds available. Once these
stated factors are sorted out, the maintenance crew is then sent to troubleshoot the problem and fix it. Repairs carried out under this philosophy range from minor repair works to complete equipment rebuilding. Estimates of costs and downtime are usually suspect, since spare parts and skilled maintenance technicians may or may not immediately be available.

This category of maintenance can be sub divided into:- Normalized maintenance, poor job execution such as, design faults and their remedies, desirable improved standard, poor workmanship and emergency.

Programmed or Planned Maintenance:
This type of maintenance can be categorized into the following subgroups namely:- Cyclical maintenance, proactive maintenance, predictive maintenance and preventive maintenance.

Cyclical Maintenance:
This is the type of maintenance that includes such works as painting and repair works prior to painting. In addition are periodic maintenance works done for health and safety reasons, such as lift and boiler maintenance. These types of maintenance works could be expressed in another way such as condition independent and condition dependent.

Proactive maintenance:
This type of maintenance involves those activities aimed at eliminating the root causes of equipment failure and this makes it possible for the life span of equipment to be extended even beyond its life span. This type of maintenance focuses in two primary root causes of equipment failure which are excessive heat and dirt. The two elements together operate to cause failure in equipment. Dirt, for instance, acts as an abrasive, which causes parts to wear and also as an insulator that does not permit heat dissipation, under proactive maintenance, the maintenance staff makes sure the equipment is clean, properly aligned, runs cool and has fluids all the time.

Predictive maintenance:
This type of maintenance includes those activities and technologies that detect pending equipment failure. Predictive maintenance is based on equipment usage and associated component wear and parts. The primary technologies involved in predictive maintenance are Vibration analysis, which reveals how much wear a part has experienced and when it is likely to fail. Oil analysis shows which parts
are wearing and how much. Thermography (infrared scanning) measures how hot a part or system is. Ultrasonic testing is used to detect excessive noise level in equipment such as failing steam traps, bad bearings, and corona discharge arcing in electrical components lastly, Electrical analysis detects faults and pending faults in electrical equipment such as switch gears, motors and control systems.

These technologies enable the facilities managers to compare existing performance with the appropriate levels of operational parameters. A facilities manager using vibration analysis, for example, could say how much a bearing is vibrating and could be compared to how it should be vibrating. Thus this approach to equipment maintenance precludes unscheduled equipment failure and the associated unexpected downtime.

**Preventive maintenance:**
This type of maintenance includes those activities that are performed routinely at planned timed intervals on specific systems, equipment or components in order to avoid failure. Example includes changing filters, oils and drive belts. This practice does not account for levels of equipment usage or wear. In fact components are often changed or replaced when they still have useful life. Routine preventive maintain in fact, requires a plan prepared at the onset by a combination of experience gained on similar facilities, imagination, life cycle data and the operator’s priorities somehow, it is easy to create a log of all the components in a maintenance plan, because nearly all factory produced components have life expectancy data available, but this is not enough to create the plan. These maintenance practices have been proven to be the most cost effective over the time. Obviously, the total cost of downtime because of maintenance and around the clock emergency repairs can be staggering. Proactive, predictive and preventive maintenance are necessary to production operations and facilities to avoid breakdown and lost of production and usage. In fact, part of the process is setting up and using productivity controls for both worker performance and maintenance levels. For effectiveness and efficiency, desired levels of maintenance expenses should be established for each facility operation against which performance can be measured. This information should be incorporated into an annual operating budget. Besides, it is also necessary to determine the percentage of maintenance time that is actually productive. All direct and indirect costs should be adequately evaluated.

**CONCLUSION**
Facilities have been seen to represent the largest single class of assets on the balance sheet of organizations and since these assets provide a service to the core business it should be mandatory, that these assets are cared for in order to
prolong their life span and reduce the possibility of costly major breakdown, emergency repairs and lost of production. In so doing total cost of downtime as a result of maintenance and around the clock emergency repairs will be greatly reduced. Many maintenance organizations in Nigeria, fail to implement new facility improvement programmes because they are unable to sacrifice the time to make the initial investment, that is necessary to learn and practice the programmes. Many of the programmes do require a substantial time investment in the beginning but will save time and money in the long run, if implemented and practiced in Nigeria. Thus in order to avoid initial failure, costly breakdown of facilities, eventual cost of production and reduced profitability, the facilities manager or users in any organization should adopt the following global best practices and recommendations of facilities management.

RECOMMENDATIONS
The following recommendations are hereby made:

- Proper cleaning should be diligently and regularly carried out as this is probably the most cost effective measure that can be applied in any office building and equipment to reduce dust and airborne contaminants, thereby making the facilities e.g. equipment, buildings etc feel fresher for users and occupants.

- Programmed or planned maintenance should be applied, for planning and schedule of maintenance activities. Maintenance works should be carried out routinely at predetermined time interval applying all the systems types of maintenance, namely cyclical, proactive, predictive and procreative.

- The implementation of programmed maintenance would be greatly assisted if at the design stage, procurement stage, selection of materials used, the construction and installation methods applied are put into considerations. In this area, the principle of whole life cycle cost appraisal or present value life cycle cost appraisal should guide in the selection of suitable form of construction from the view point of future maintenance.

- Reduction of corporate expenditure on maintenance to the organization can implement some of these practice such as total productive maintenance programme, which relies on machine operators maintenance, engineering personnel and vendors working as a team to improve the effectiveness of equipment. This involves transferring some maintenance tasks to the machine operators for example, oiling and
greasing the machine. This has the objectives of increasing equipment availability and output without adding personnel or extra shifts.

- Reliability centered maintenance: This method maximizes funds appropriated for maintenance and helps the organization to avoid costly downtime. It focuses on scheduling maintenance activities by calculating overall system reliability, based on the reliability of components of parts that require maintenance.

- Training and retraining of operators and users of facilities, especially equipment on basic maintenance and minor repairs skills.

- Setting up of facilities maintenance centre (EMC) especially for equipment, in order to effect maintenance activities. Organization should also set up equipment maintenance committee members (EMCM) comprising of a team of experts from the engineering, science and technical fields, to manage the affairs of the equipment maintenance centre for effective and efficient performance that is result oriented.

- Proper documentation of all maintenance activities and operations records should be ensured and practice.

- Facilities managers should be appointed in organizations to oversee and be in charge of maintenance activities, operations and implementation processes.

REFERENCES
Berard C.I. (1938), The Functions of the Executive, Harvard University Press, mass.
Colland R. (1989), Total Quality-Success through people, London IPM.


