

## Abstract

*In Nigeria, most public universities are currently under pressure to preserve their respective built environments. The poor states of facilities on campuses of public universities has been the concern of stakeholders of these institutions because, the facilities are no longer able to support academic activities as they did decades ago. Several factors may be blamed for the deteriorating states of the facilities. However, most of these factors may be directly or indirectly related to maintenance management systems in use by the maintenance managers. In this paper, a bespoke approach for an effective maintenance management system for facilities at public universities in Nigeria is proposed. The paper is based on theoretical understanding of maintenance management and previous research findings about the deteriorated states of facilities and an insight into the maintenance management systems that are currently operated at the public Nigerian universities. It is noteworthy that there are no policies/strategies that guide maintenance activities of the departments/units saddled with such responsibilities (strategies cannot be developed in isolation of any impact factors). In addition, gaps exist between the top management staff that have the decision making and planning skills and the on-site operations staff that carryout the maintenance task on site. The need for proactive approaches for facilities at the Universities is an important drive towards sustainable campuses.*

## 1\_ Introduction

Establishing universities is prioritised on development agendas of most former colonial countries, because of the perceived importance of human resource development and perceived national prestige (Adesina, 2006). In Nigeria, the society looks up to the universities for essential knowledge and skills that are required for improvement in the quality of life and the sustenance of the economy (Kazeem & Ige, 2010). These institutions play very important role in building and sustaining developments in the nation, and most times they form part of committees or organisations that lead sensitive international corroborations on behalf of the country. For instance, the United Nations' (UN) Sustainable Development Solutions Network, (SDSN) launched its Nigerian branch in 2013 in consortium with Nigerian universities. The SDSN-UN was launched in 2012 with a primary objective of promoting practical approaches to solving sustainable development Goals. SDSN-Nigeria outlined key objectives that include:

*"Promote sustainability as a way of life in all spheres of activities within the university, in infrastructural and physical development, care of the environment, and promotion of individual and collective behaviour consistent with concern for the future of the planet"* (SDSN-Nigeria, 2015).

This objective touches on issues that relate to sustaining physical environment, thus, it becomes imperative for Nigerian universities to ensure that this objective is addressed on their respective campuses to enable them lead or help other communities in achieving same efficiently. A good starting point is to rethink maintenance approaches that will salvage the existing campus

## BESPOKE APPROACH FOR MAINTENANCE MANAGEMENT OF FACILITIES AT NIGERIAN PUBLIC UNIVERSITIES

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facilities because, there is a growing concern about the deteriorating situation of built facilities on campuses of many Public universities in Nigeria. This is in line with research works reports that affirm that facilities provided at many public universities in Nigeria are in a state of structural disrepair (Abigo, Madgwick, Gidado, & Okonji, 2012; Adamu, 2015). Ineffective maintenance approaches is identified to be a major factor responsible for the gross disrepair (Omoregie, Ebohon, & Radford, 2005).

In this paper, the term ‘facilities’ refers to all built assets that make up the built environment. Universities are responsible for providing facilities to cater for academic (teaching and research) activities on their respective campuses. Some ensure that residential facilities are provided, for both student and staff on campus (Pat-Mbano, Alaka, & Okeoma, 2012, Adamu, 2015). These facilities are the most valuable assets of universities after the students and staff (Pat-Mbano, Alaka, & Okeoma, 2012). This is factual because, adequate provision and effective maintenance of facilities on campus creates enabling environment for smooth running of academic activities (Idrus et al., 2009).

## 2\_Maintenance in the Context of the Built Environment

*“The built environment expresses in physical form the complex social and economic factors which give structure and life to a community. The condition and quality of buildings reflect public pride or indifference, the level of prosperity in the area, social values and behaviour and all the many influences both past and present, which combine to give a community its unique character. There can be little doubt that dilapidated and unhealthy buildings in a decaying environment depress the quality of life and contribute in some measure to antisocial behaviour” (Lee, 1987).*

Moreover, the condition and quality of a built environment is a major factor that determines the quality of life, because people spend over 95% of their time around building structures (Wordsworth & Lee, 2001). Over 90% of university activities are conducted within the built areas of the campus. On a second note, the condition of the built facilities reflect the well-being of the university community and their productivity (Lateef, 2010). The role of maintenance managers in preserving the built environment cannot be over emphasised. However, the maintenance management is perceived to be a complex undertaking that is often associated with wide difficulties in planning and executing tasks (Marquez & Gupta, 2006). Therefore, maintenance managers require adequate knowledge of the concepts and principles of maintenance management in tackling these challenges. This is in addition to operational and functional knowledge of the facilities.

The term maintenance is defined as “combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to a state in which it can perform the required function” (CEN-EN, 2010). Maintenance management of facilities is concerned with efficient utilisation of resources (material, labour and time) towards meeting certain sustainable and value adding needs such as reliability, safety, and functionality of built facilities (Idrus, Khamidi, & Lateef, 2009). Combination of technical knowledge of the facilities and maintenance management enables

the developing an effective maintenance management frameworks. An effective maintenance management system must be consistent, proactive and holistic (Abdul Lateef, Khamidi, & Idrus, 2011). Maintenance requirements are comparatively demanding, because multiple tasks are involved; moreover, the effectiveness of a maintenance approach largely depends on the managerial procedures (Hon Yin Lee & Scott, 2009).

## 2.1\_Conceptual Framework of Maintenance Management

Maintenance approaches in many organisations, particularly in the manufacturing industry has been evolving for over ten decades. The decennial trend have been discussed in maintenance related literature (Dunn, 2003; Pintelon & Parodi-Herz, 2008). These studies attest that maintenance function is no longer a mere technical function but a strategic issue that requires strategic management skills in operating and maintaining facilities optimally. However, the perceptions and approaches of maintenance in the building industry has experienced very little change, therefore innovation is scarce in facilities maintenance management, especially in relation to the building industry (Cloete, 2001).

The term ‘maintenance management’ combines two important and distinct functions viz. operational and managerial. The range of skills required for operational functions is very different from those required for managerial input. The operational aspect requires purely technical skills, while the managerial deals with decision making, precisely “what and how to decide”(Pintelon & Parodi-Herz, 2008). A combination of non-technical and technical approaches in many management based systems is important in achieving an effective and efficient management system (Leong, Zakuan, & Saman, 2012).

Maintenance management is a goal-driven process that requires basic management principles to plan and execute maintenance works efficiently. A sustainable maintenance management system engages strategic management activities that revolves around data collection, strategy formulation and evaluation, programme selection, implementation and feedback (Idrus, Khamidi, & Lateef, 2009). In line with this, strategic and performance management are major aspects, which require understanding and consideration in the maintenance management of built facilities (Hon Yin Lee & Scott, 2009). These distinct but interrelated aspects of management focus on supporting main objective of the organisation, which is linked to the mission and vision of the organisation. Therefore, accurate perception of the mission and vision of an organisation supports its ability to set appropriate maintenance standards and policy for the maintenance operations of its facilities.

Operations management functions consists of various tasks to be executed in accordance with a maintenance policy/strategies developed by strategic management (Marquez & Gupta, 2006). This is necessary for achieving the maintenance objectives as set by an organisation for maintaining a facility and its associated services (Lateef, 2010). The basic tasks in this process are corrective or preventive operations; where the former refers to all activities undertaken after the occurrence of a failure, while the latter refers to activities in anticipation of a failure occurring (McLean, 2009). The execution of

maintenance tasks involves one or a combination of the following activities; service, rectification or replacement (Buys, 2004).

The enormous task of developing and implementing a maintenance system for built facilities on a university campus is beyond the skills of technical staff (tradesmen such as carpenters and electricians) that diagnose and carry out most maintenance works on university facilities. Therefore, an excellent practice of maintenance management is greatly needed to increase the life cycle of the property and to minimise unexpected breakdowns or deterioration effects. In this respect, modern maintenance managers will have to rely as much as possible on knowledge and practical management skills to carry out maintenance tasks efficiently (Zulkarnain, Zawawi, Rahman, & Mustafa, 2011).

Figure 1 presents the authors' conceptual framework for an effective maintenance management of built facilities developed from articulated theories that underpin maintenance management. The framework depicts three rings that interlock within a universal set represented by the rectangular shape.

Figure 1. Conceptual framework for facilities maintenance management.



The conceptual framework draws inspiration from the fact that maintenance strategy developers and managers are usually at one end of the spectrum. On the other end is the operations management team that are active on the physical maintenance site. Although skills required for strategic management differ from that of operations or onsite work management, there is need to establish a link between the two functions to enable focus on a single maintenance goal. Performance management is found to be an ideal function that would serve the purpose of transforming strategies/policies in relation to resource availability to develop plans of action for maintenance operations.

### 3 Establishment and Structure of a university campus in Nigeria

All universities in Nigeria that were established from 1960 (National Independence) to early 1980s (economic prosperity period) were solely owned by the Federal Government of Nigeria (FGN); therefore these institutions were on an exclusive list of the FGN to receive funds and management support (Ajayi & Ekundayo, 2008). The campuses were designed and constructed on extremely large expanses of land, far from main towns or cities with provision to house both staff and students; and intended to be self-sufficient communities (Esenwa, 2003). Facilities in the universities

were adequate and furthermore, they received pre-requisite maintenance because there was sufficient funding from the FGN (Ikediashi et al., 2012).

Basic infrastructural development on campuses of most public universities in Nigeria and utility services include:

1. Classrooms, workshops, laboratories, ICT centres
2. libraries;
3. student and staff residences;
4. clinics/health centres;
5. worship centres (churches and mosques);
6. student centre, staff club;
7. sports and gymnasium;
8. market/shopping centres, banks, eateries, security posts;
9. electric power and water supply, road networks, street lighting and illumination and landscaping

(Adamu, 2015; NEEDS, 2012; Uche, Okoli, & Ahunanya, 2011).

Many State Governments (SGs) in the country have established universities and private-owned universities too have emerged because the FGN is currently experiencing difficulties in providing university education for the nation's teeming populace. However, all universities, are faced with managerial challenges within a very unstable socio-economic environment (Arowolo & Ogunboyede, 2013). Although, the public universities are still fully dependent on FGN for capital expenditure as well as supporting recurrent expenses incurred, these have drastically reduced and the senior management of the respective universities are forced to operate within tight budgets (Olaleye, 2012). The situation is blamed on the continuous increase in the intake of students with every academic session despite an increase in the number of both public and private universities established to date and ineffective management strategies/policies (Adamu, 2015; Akingbohunbe & Akinluyi, 2012; Ojedokun, Odewumi, & Fasola, 2012).

#### **4\_Maintenance management framework for Nigerian Public university facilities**

Maintenance management of the built environment of a university is an important service that must be afforded the desired attention by top management. The effectiveness of the maintenance management system has an impact on the condition of the buildings and in turn, the health and safety of staff and students that occupy or operate the facilities. These facilities support the core business of a university establishment none other than research and dissemination of specialist knowledge for the purpose of socio-economic development.

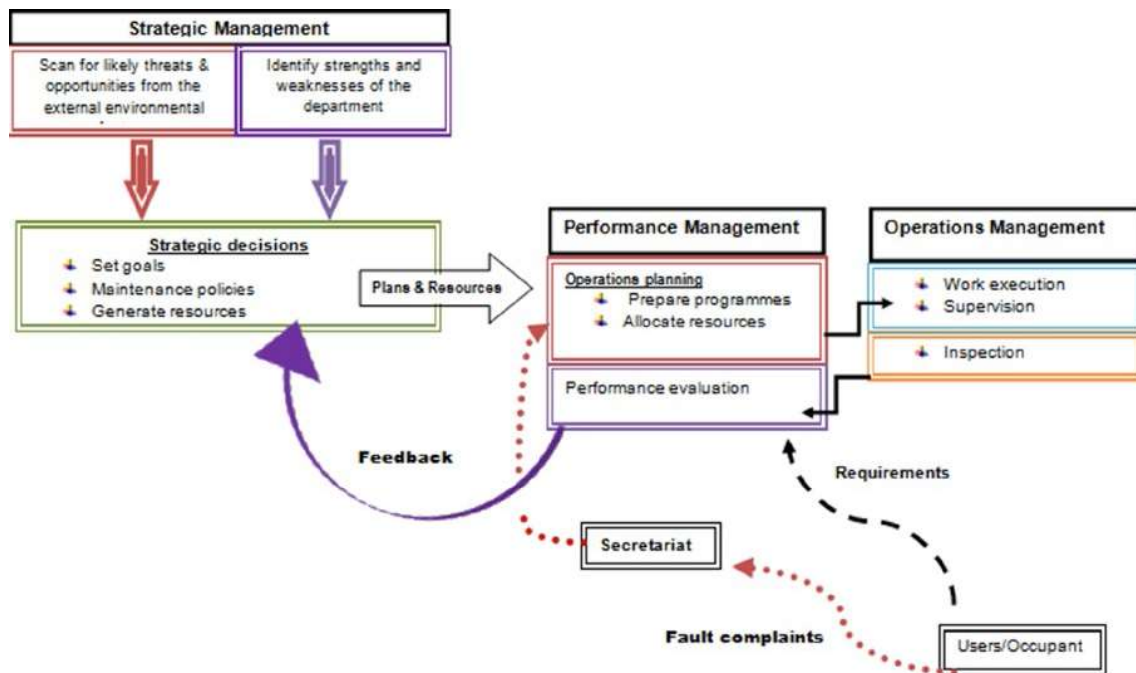
An effective maintenance management system integrates the principles of strategic management, performance management and operations management. However, the maintenance management processes for all the public universities studied have no strategic focus because no strategic planning activities are carried out to understand the nature of the facilities, their use and nature of failure or maintenance requirements. Adequate and higher level of understanding of the value and positioning of maintenance would

necessitate the development of an effective maintenance management approach for built facilities.

The framework was developed, firstly from the articulated concepts of maintenance management from the literature and the gaps in the systems obtainable at the surveyed institutions. Secondly, from an understanding of current condition and the maintenance systems in place the public universities studied.

The framework is presented on Figure 2. The framework depicts three main aspects of management that are involved and describes the responsibilities and span of control.

Figure 2. Maintenance management framework for built facilities at public Nigerian Universities.  
Source: Adamu, 2015.



The framework is based on the principles of strategic planning and decision-making. There are three management components that are major actors in the process. The process is described in the following sections.

#### 4.1.1 Maintenance Strategy Formulation

The managers at this level are required to be construction and property professionals that have strategic planning skills and experience. Knowledge and skills of construction and facilities management will be of great advantage to the team. The plan of action for the maintenance strategic management function is based on a structured planning method popularly known as the 'SWOT analysis' (Strengths, Weaknesses, Opportunities and Threats). The stage begins with identifying the external environmental factors that are perceived to have major impact on the maintenance of the facilities. The behaviour or changes in the factors can either have positive or negative impact on the maintenance system. Identification of the environmental factors (both internal and external) sets the parameters within which maintenance is to be managed; and their analysis provides a clear basis for forming maintenance objectives and consequently, the planning and control of maintenance .

Those factors that have positive impact are regarded by managers as opportunities, for instance, improved infrastructure or boost in the economy. The factors that have negative effect are regarded as threats to the system, for instance, poor government policies or their implementation; increase in the population of students could be considered as threat to effective maintenance. In Nigeria, certain economic factors (domiciled within the external environment), e.g. drop in the oil price (national recession) has been a major harmful factor on the internal finances of the universities (given that all public universities in Nigeria depend on Federal Government of Nigeria for disbursements) which in turn affects the budgetary control of maintenance (making planning even more crucial). Maintenance strategic managers are saddled with the responsibilities of formulating and re-formulating maintenance strategies.

#### 4.1.2\_Strategy Implementation

The developed and evaluated strategic plans are executed at this stage. The implementation process involves carefully allocating roles and responsibilities among managers (typically through the design of the organisational structure), allocating resources, setting short-term objectives, and designing the organisation's control and reward systems (Hill & Jones, 2012; Tse, 2010). Strategy implementation includes developing a strategy-supportive culture, creating an effective organisational structure, redirecting marketing efforts, preparing budgets, developing and utilising information systems, and linking employee compensation to organisational performance (David, 2011). Maintenance performance managers at this stage must have adequate understanding of the maintenance strategies handed over to their unit by the strategic managers. Based on the strategies formulated, the performance managers develop operations plans for the effective implementation of the strategies. Furthermore, maintenance programmes could be prepared to guide the actual work execution by the operation managers.

#### 4.1.3\_Strategy Evaluation

At this stage, effectiveness of the strategy is evaluated to locate shortfalls of the plan for necessary adjustment or change where the desired results are not achieved (Tse, 2010). A feedback mechanism must be established between the operations managers that execute the maintenance works to the performance managers and in turn, the strategic managers. Information about the efficiency of a strategy may be improved or re-formulated by the strategic management team as the case may be. Consistency of the cycle is necessary for a sustainable university campus that will continually support academic activities.

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