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Assessment of Sustainability Strategies for Building Maintenance Practices

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Abstract: The study examined the sustainability strategies for building maintenance practices. This study adopted a surveys research style. The research population comprises of students, staff of works department and physical planning units in Nnamdi Azikiwe Univeristy Awka. cluster sampling technique was adopted for the study. The instrument used was a structured questionnaire. To ensure the validity of data collection instrument, the questionnaires was submitted to the researchers supervisor who assessed the content and structure. The test for reliability of the instrument was done using the Cronbach's Alpha. To ensure the validity of data collection instrument, the questionnaires was submitted to the researcher's supervisor who assessed the content and structure. The study showed that routine maintenance work like painting, servicing equipment's and machineries, e.t.c is the mostly adopted sustainability strategy for the maintenance of buildings and facilities in Nnamdi Azikiwe University. It was concluded that adopting environmentally conscious approaches significantly enhances the longevity, efficiency, and cost-effectiveness of buildings. One of the recommendations made was that the institution should adopt proactive sustainability strategies such as routine maintenance work, process management and integrated project delivery system, as they are more economical and effective.

Keywords: Sustainability Strategies and Building Maintenance Practices.

INTRODUCTION

Building maintenance is an aspect of construction industry, which refers to the work undertaken in order to keep, restore or improve every facility, that is, every part of a building, its services and surroundings to a currently acceptable standard, and to sustain the utility and value of the building (Owolabi, Amusan, Gani, Tunji-Olayeni, Peter and Omuh, 2014). Building maintenance refers to 'a combination of any action carried out to retain an item in, or restore it to an acceptable condition' (Brennan, 2000; Owolabi *et al*, 2014).

Sustainability strategies for building maintenance practices are fundamental concepts of the construction industry. Sustainability strategies in this study refer to a plan of actions or a renewable plan(s) intended to accomplish maintenance practices that will sustain a building for an indefinite period without damaging the building, or without depleting a resource. The centrality of sustainable building maintenance practices has stimulated a wide ranging literature on its examination in Nigeria (Amusan *et al*, 2015). As a matter of fact, no description in the built environment profession can be complete without discussion of sustainability strategies for building maintenance practices (Amusan *et al*, 2015). According to Nwanze (2010), the estimated total number of public buildings in Nigeria as at 2009 was one thousand, five hundred (600 at Federal level and 900 at State and Local Government levels), which is a nice beginning. But poor

sustainable strategies have rendered most of the buildings ineffective in terms of performing their functions.

As a result, Nigeria has recorded poor performance in the building maintenance practices (Nwoye, 2002). Sequel to that, the economic recession in the early 1980s brought a focus on sustainability strategies for building maintenance practices in Nigeria. This x-rays that the sector was crowned by problems such as no/poor sustainable strategies for building maintenance, poor maintenance services, mismanagement and corruption (Alabi, Onimisi, and Christain, 2010). The issue of poor maintenance cum poor management, is witnessed in the condition of some public and private buildings in Nigeria. This means that sustainable practices for building maintenance is still an emerging concept in Nigeria Construction Industry (NCI). Therefore, the need for this study.

Statement of Problem

The major challenges facing most buildings in the study area (Nnamdi Azikiwe University Awka, Anambra State) are dilapidation and deterioration, which has led to reduced life span of the buildings, reduction in the functionality of the building, increase in the cost of maintaining the building. This study seeks to solve the above identified problems by determining the factors that hinders the implementation of sustainable strategies for building maintenance practices and therefore, develop effective sustainable strategies for building maintenance practices in Nnamdi Azikiwe University Awka, Anambra State.

Research Question

i. What are the major sustainability strategies for building maintenance practices?

Research Objective

i. Examine the sustainability strategies for building maintenance practices in the study area,

Conceptual Review

Concept of Sustainability

Sustainability is the ability to sustain something. To sustain, on the other hand, is to keep in existence. Many scholars have different views to the definition of sustainability. One of the schools of thought is the one that views sustainability from the point of view of sustainable design/construction perspective. According to Solomon (2005) and Nadel (2007), sustainable design/construction refers to the proper use of land, minimisation of waste water, the use of less mechanical energy, understanding the site ecology, the application of eco-effective and recyclable materials, among others. To another school of thought, sustainable concept is reviewed from the perspective of eliminating associated negative impact of infrastructure on users and environment. This school of thought emphasise on maintaining infrastructure form and structure, and argue strongly that, it is a design and construction practices that significantly reduce or eliminate the negative impact of building on the environment (Amusan, *et at*, 2015).

Solomon (2005), defines sustainable buildings as those that through their design, spatial orientation, choice of building components, construction and operational strategy, are highly efficient and also have low operating costs, environmentally friendly, and do not affect the health of their users and occupants negatively. On the other hand, building otherwise known as structure, is according to Arayel and Adam (2001) defined as structures that includes; houses, facilities, offices, schools and hospitals, which serve as shelters for humans. Buildings are also defined as closed structures with walls and roofs. Macginley (1998) asserts that buildings are utilised primarily for living, working, storage and are categorised into three: 1. the monumental structure, which comprises of the churches, sport arena and city halls; 2. the institutional structure, which comprises structures such as the block of flats, tertiary institutional buildings for academic and administrative purposes, and 3. the industrial structures like the ordinary small scale industrial types.

Odediran, Opatunji and Eghenure (2012) opines that the built environment expresses in physical, forms the complex social and economic factors, which shape the structure of and give life to a community. Drawing upon Odediran *et al's* assertion, it is gathered that buildings in their physical form or shape give life to a community. Again, for Odediran *et al* (2012), building is that, which are basically required to provide a conducive and safe environment for the performance of various human activities. From their own perspective of building, it is inferred that the ability of a building to provide the required environment for a particular activity is a measure of its functionality. These functionality can be enhanced through the concept of sustainability (Odediran *et al*, 2012).

Sustainability Strategies

Recently, sustainability strategy issue has dominated the arena of discussion in the built environment. Nonetheless, billions of dollars' worth of building investment are being initiated over the world, but little emphasis is placed on the aspect of maintenance of such infrastructure (Amusan, Anosike and Ogunde, 2015). They emphasise that in the tropic, careful consideration is often given to planning while proactive thought is not often accorded to the maintenance aspect. This, however, is common to the public utilities and infrastructures. Unfortunately, most sectors according to Amusan *et al* (2015), are yet to give issue of sustainability strategy an appropriate consideration. In this regard, buildings meant for human habitation are developed without much emphasis on design concept, space ergonomics, construction process, renewable material and post construction post occupancy requirement. However, this could result into building an unstable buildings, which is bound to bring to the investors' economy an untold hardship and to the country's economy at large. However, time has come when that paradigm should shift from non-sustainable development to sustainable one through proactive strategy, which this study intend to achieve with focus on evaluating sustainability strategies for building maintenance practices in Nnamdi Azikiwe University Awka, Anambra State, Nigeria.

Therefore sustainability strategies in this study refer to those sustainable plan of actions intended to accomplish a specific goal – building maintenance, which involves provision for adequate maintenance of the existing building structures. In the built environment profession, sustainability strategies for building maintenance practice are among the major problems ravaging and undermining the developing countries, Nigeria is one of such countries. As a matter of fact, Nigeria as a developing country is greatly confronted with insufficient sustainable strategies for building maintenance practice (Amusan *et al*, 2015). Hence, the need for this research work. As life span enhancement necessitates a culture of adequate maintenance practices, in the same way, building requires adequate building maintenance practices.

Building maintenance practices

Building maintenance practices are vital aspects of construction industry, which their importance cannot be over emphasised. Because of its importance, maintainability of building has become one of the key areas in which the construction industry must achieve significant improvements. The British Standard (BS) (3811) assert that maintenance practices refer to "the combination of actions carried out to retain an item in, or restore it to an acceptable condition". Odediran *et al* (2012) defines building maintenance as the work undertaken in order to keep, restore or improve every facility, that is, every part of a building, its services and surrounds to a currently acceptable standard, and to sustain the utility and value of the building (Owolabi, Amusan, Gani, Tunji-Olayeni, Peter, and Omuh (2014); Brennan, 2000). Owolabi *et al* (2014) views maintenance as synonymous with controlling the condition of a building so that its pattern lies within specified regions.

Odediran *et al* (2012) asserts that maintenance management is concerned with the planning and control of construction resources to ensure that necessary repairs and renewal are carried out with maximum efficiency and economy. Kolawole (2002) argues that maintenance culture requires the correct diagnosis of defects, current remedial measures, sound technical knowledge of material usage, management resources as well as the formulation and implementation of integrated plan

and policies to sustain utility. He explain further that the absence of these qualities has led to the decay of the nation's physical, social, aesthetic and economic environment. Bamgboye (2006) refers to maintenance as the art of binging back the operating condition of an asset into normal functioning at a minimal cost capable of enhancing the life span of the item. He explains further that maintenance is also the ability and skill of keeping infrastructure available for normal use.

Consequently, Odediran *et al* (2012) aver that maintenance just like the last leg of a relay team, and the lubricating oil of an engine, is a component of a conclusive phase of sustainable development. Besides, Owolabi *et al* (2014) view maintenance as that which assists in retaining economic life of buildings. They also said that maintenance is an activity that requires high level of productivity at the private and national levels. The operational definition of building maintenance practices is in line with *Owolabi et al* (2014) definition of building maintenance practices, where building maintenance practices refer to works undertaken in order to keep, restore or improve every part of a building, its services and surrounds to a currently acceptable standard, and to sustain the utility and value of building. Building maintenance practices include, among others; renovation such as re-roofing, repainting, re-plastering, and so on.

Building Maintenance Practices in Nigeria

In Nigeria, the organisation and implementation of maintenance strategy have not been given adequate attention and so very low results are realised in the use of assets, which led to the country being categorised as part of poor maintenance culture for engineering infrastructure, among others (Uma, Obidike and Ihezukwu, 2014). Dishearteningly, huge and very expensive projects are allowed to go into disuse in a short while due to lack of maintenance culture. Concisely, the establishment of infrastructure in Nigeria is not easily attained, but the extent to which the existing ones are allowed to deteriorate owing to lack of maintenance culture is a thing of worry (Uma *et al*, 2014).

The situation in Nigeria can be attributed to poorly equipped maintenance department where it exist; insufficient funding for operation and maintenance; poor arrangement of institution; inappropriate technologies; lack of spare parts; transfer of plants without enough manpower requirement on ground and insufficient monitoring and evaluation of operation of infrastructure (Uma *et al*, 2014).

Disgustingly, most infrastructures in Nigeria are decayed and need repair, rehabilitation or replacement (Oyedele, 2012). All over the world, the activity of all economic agents depend on efficient and effective infrastructure. The two categories of infrastructure are the hard and soft infrastructure. The hard infrastructure are broadly physical networks essentially required for the functioning of modern industrial nation while soft infrastructure involves all the institutions which are relevant to enhance economic, health, cultural and social standard of a country, among which are the financial, the education, the health, the governance and judiciary systems, and including security (Kumar, 2005). This situation is arrived due to little or no maintenance at time they were minor problems. But the power to make, improve and destroy rest in the government. The situation of decay of environmental facilities for production needs urgent attention if the country must achieve a pass mark in the millennium development goal by 2015.

Each aspect of the infrastructure needs sufficient maintenance if it must achieve the goal for which it is established. Every facet of production; be it at the private or public sectors in Nigeria involves capital overheads, but over the years the attitude of leaders and public servants experienced poor transportation infrastructure due to insufficiency and lack of maintenance, which have encouraged low production, low foreign investment, unemployment and poverty (Uma *et al*, 2014). Really, when a considerable chunk of the population are seriously constrained from working and earning income due to lack of capital overheads, and the available ones are in a deplorable state, it gives room for diversion of investment, thereby discouraging average resources capacity utilisation, under employment, and consequently poor living standard (Uma *et al*, 2014).

Nigeria had about 195,500km road network all over the country. Out of the whole, a proportion of about 32,000km are federal roads while 31,000km are state roads. A large proportion of these roads are so poor due to insufficient investment and lack of adequate maintenance (FRN, 2000). However, each of the tiers of government shared the responsibility of planning, construction and maintenance of roads in each respective domain. This bargain is aimed at even development of the entire country (Ighodaro, 2009; CBN, 2003). Unbelievably, lack of adequate maintenance has made these roads very poor, and as such has retarded the level of resources mobility over the years, which is associated with economic backwardness effects, in terms of inefficient mobility of inputs of production and low income generation.

Many schools and tertiary institutions started with relevant equipment, vehicles and laboratory facilities, among others. Although there is high degree of paucity required infrastructure in Nigeria universities, colleges and schools, but the few ones that are available, there is no provision for sufficient maintenance. Unfortunately, many were allowed to become useless due to minor faults and so gradually lived beyond their life span without getting maximum benefit there-from. Government has always found it so difficult to provide schools' equipment and laboratory facilities. The few schools enjoying some, lack maintenance because of poor attitude to maintenance culture. This situation has resulted to gross insufficiency as no new ones are forth coming and the old ones are in disuse state (Uma *et al*, 2014).

Sustainability Strategies for Building Maintenance

In Nigeria, according to Dahiru, Abdulazeez (2010) and Mbamali and Okotie (2010), the Nigeria construction industry was without uniform regulations, guidelines and standards for the design, construction and operation or maintenance strategies for buildings until 2006, when discussion for National Building Code started. It is acknowledged that the situation in Nigeria building industry has in no small measure improved in some respects, the little or no adequate consideration for sustainability strategies for building maintenance practices in the National Building Code (2009), within the current practice in the construction sector (Dahiru *et al*, 2010). However, to sustain or to reach sustainable strategies for building maintenance practices, there is need to understand the barriers to sustainable building maintenance practices, which allow the development of lasting strategies, in order to ease its implementation not only in Nigeria, but also in other developing countries as well. Nonetheless, this study is not in any form prioritising the barriers to sustainable strategies for building maintenance practices in Nigeria, rather, the study argues that identifying those barriers will greatly help in mapping out sustainable strategies that will improve on condition of building maintenance practices, and yield fruitful results.

Nielsen, Jensen and Jensen (2009) evaluates the extent to which sustainable facilities management is integrated in the operations of housing estates in Denmark. The research work identified social housing, owner – occupier/private co-operatives and private renting as the three types of ownership in the housing sector. The research further identified individual metering, energy labelling of buildings, and green accounting for residential buildings, green homes and energy management as some of the regulations and tools for sustainable building operations. The results from the research showed good practices of sustainable facilities management in the social housing sector that led to reduction in energy, water and waste generation. The research concluded that different types of ownership will demand different types of facilities management solutions thus determining the success of sustainable facilities management. Although the outcome of the research is limited to residential housing sector, sustainable practices can be applied to all housing types. However, the success of a particular sustainable strategy in an organisations does not guarantee its success in another organisation especially if their activities differ.

Methodology

This study adopted a surveys research style. The research population comprises of students, staff of works department and physical planning units in Nnamdi Azikiwe Univeristy Awka. cluster sampling technique was adopted for the study. The instrument used was a structured questionnaire.

To ensure the validity of data collection instrument, the questionnaires was submitted to the researchers supervisor who assessed the content and structure. The test for reliability of the instrument was done using the Cronbach's Alpha. To ensure the validity of data collection instrument, the questionnaires was submitted to the researchers supervisor who assessed the content and structure.

Data Analysis

Table 1: Sustainability Strategies adopted for the Maintenance of Buildings and Facilities in Nnamdi Azikiwe University Awka

S/N	Variables	SD	D	U	A	SA	∑F	Mean	Std. Dev.	Ranking
1	Carrying out Repairs when a Facility stops Functioning	7	7	0	38	18	70	3.76	1.233	7th
2	Routine Maintenance Work like Painting, Servicing Equipments and Machineries, e.t.c	2	3	3	37	25	70	4.14	0.905	1st
3	Fumigation of the premises against insects and rodents	2	6	21	17	24	70	3.79	1.102	6th
4	Re-engineering of the Building and Maintenance process	3	6	16	29	16	70	3.70	1.054	8th
5	Incorporating Eco-friendly Construction Materials	3	3	17	23	24	70	3.89	1.071	5th
6	Introduction of New Construction and Maintenance Concepts	2	4	12	33	19	70	3.90	0.965	4th
7	Integrated Project Delivery System such as increasing the recyclable contents of buildings	1	8	6	34	21	70	3.94	0.991	3rd
8	Process Management	3	13	0	32	22	70	4.04	0.824	2nd

Source: Researcher's Field work, 2019

It can be seen from the table that routine maintenance work like painting, servicing equipment's and machineries, e.t.c is the mostly adopted sustainability strategy for the maintenance of buildings and facilities in Nnamdi Azikiwe University, as its ranked 1st. More so, process management ranked 2nd, integrated project delivery system such as increasing the recyclable contents of buildings ranked 3rd, introduction of new construction and maintenance concepts ranked 4th, incorporating eco-friendly construction Materials ranked 5th, fumigation of the premises against insects and rodent's ranked 6th, carrying out repairs when a facility stops functioning ranked 7th, while re-engineering of the building and maintenance process (8th) is the least ranked. . This is in agreement with Amusan *et al* (2015) research work which found that proactive strategies such as

those mentioned above are the key elements in the development and maintenance of infrastructures.

Conclusion

The assessment of sustainability strategies for building maintenance practices reveals that adopting environmentally conscious approaches significantly enhances the longevity, efficiency, and cost-effectiveness of buildings. Strategies such as routine maintenance work like painting, servicing equipment's and machineries, e.t.c is the mostly adopted sustainability strategy for the maintenance of buildings and facilities in Nnamdi Azikiwe University. Although challenges like limited funding, lack of technical expertise, and resistance to change persist, the long-term benefits—such as reduced carbon emissions, improved indoor environmental quality, and resource conservation—strongly support the integration of sustainability into maintenance operations.

Recommendations

1. Building owners and facility managers should establish clear sustainability policies that integrate maintenance strategies with energy efficiency, waste reduction, and environmental impact minimization.
2. The institution should adopt proactive sustainability strategies such as routine maintenance work, process management and integrated project delivery system, as they are more economical and effective
3. Regular training and workshops should be provided to maintenance personnel to improve their understanding of sustainable practices and the use of green technologies.

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