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Effect of Incorporating Sustainability Strategies into Building Maintenance Practices

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Abstract:

The study analyzed incorporating sustainability strategies into 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 University 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 researcher's 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 maintaining same level of service, that is extra cost of repair and replacement are reduced (1st) has the most severe effect on incorporating sustainability into building maintenance practices in Nnamdi Azikiwe University Awka. It was concluded that sustainable maintenance not only supports regulatory compliance but also contributes to broader climate goals and corporate social responsibility. One of the recommendations made was that the best sustainability strategies suitable for the maintenance of buildings in the study area should be adopted, as it will prolong the usefulness and effective life of buildings in the study area.

Keywords: Sustainability Strategies and Maintenance Resources

Introduction

The achievement of an efficient construction industry and sustainability of its products has been the major debates among professionals and other stakeholders in the industry. Oladapo (2006) posits that maintaining school/public buildings in good condition through preventive measures, will allow avoidance of repetitive capital expenditures. There has been an upsurge in the rate at which researches are conducted on construction industry, especially in the area of sustainability strategies for building maintenance practices in Nigeria (Amusan, Anosike and Ogunde, 2015). The importance of functional building maintenance practices in Nigeria cannot be over emphasised. Construction industry is a major driver of economic growth of any country, which it activities facilitate social

development in all aspects. Also, maintenance practice helps in retaining economic life of building. As a result, building maintenance is an activity that requires a high level of productivity at the private and national levels (Owolabi *et al*, 2014). That notwithstanding, one of the key areas in which the construction industry achieve significant improvements has been identified as the maintainability of building. Maintaining building in good condition through sustainable strategies or preventive measures prevents unwarranted loss and expenses on the owner. Zubairu (1999) and Fielden (1997), argued lack of preventive maintenance culture in general leads to undesirable conditions of building.

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.

Statement of Problem

The 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 Objective

i. Examine the effect of incorporating sustainability strategies into building maintenance practices in the study area,

Research Question

i. What are the effects of incorporating sustainability into building maintenance practices?

Conceptual Review

Concept of 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.

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.

Nielsen *et al* research work is related to this present study, since both studies examines sustainability strategy and ways of integrating them into an organisation. That notwithstanding, Nielsen *et al's* study differs from this present research work as their geographical locations are not same. Nielsen *et al* country where the research work was carried out is Denmark while, the present research work country is Nigeria. Again, they differ in their choice of topics for the study. The present study topic is evaluation of sustainability strategies for building maintenance practices in Nnamdi Azikiwe University Awka, Anambra State, Nigeria, while Nielsen *et al's* research topic is evaluation of the extent to which sustainable facilities management is integrated in the operations of housing estates in Denmark.

Some of this sustainability strategies include:

i. Retrofitting

ii. Recycling

iii. Reusing

iv. Process management

v. Incorporating eco-friendly materials.

Integrated Approach in Infrastructural Design and Construction (I.A.I.D.C.)

Because there is tendency for design process to increase in importance and complexity, there is therefore an urgent need for an integrated approach requiring among others co-engineering partnership between designers, engineers, and manufacturers. This will engender work cohesion in changing design information for an optimised alternative. This will enable adequate feedback for future design and improvement and as well information on best approach to maintain the existing infrastructure, so as to sustain them in form, structure and function (Amusan *et al*, 2015).

Process Management (P.M.)

Management and Organisation of key factors that comes to play in sustainability issue is as important as the concept itself. The subject must engage other issues not only technical aspect, but as well social, legal, economic and political matter. A structuring of the maintenance problem must be done in such a way that the complex interrelationship can be modeled for communication purpose. Also, a system of measuring progress must be put in place so that the extent of progress achieved can be appraised. A management framework must be developed which allows for planning, design, construction, monitoring and feedback on sustainability, as a key element in the development occupation and maintenance of infrastructures (Amusan *et al*, 2015).

Integrated Project Delivery System (I.P.D.S.)

An integrated delivery system is needed if the sustainability of engineering infrastructure will be realisable. Key actors involved are to be galvanised, from federal government, state government, and local government to designer, client, manufacturers and suppliers. Research has revealed that public infrastructures are poorly maintained, the federal government then should ensure the development of clear national sustainable policies and plans, local governments on the other hand holds key responsibility for land use, planning and implementation of sustainability policies as formulated by the federal government. Designers, builders and clients are responsible for reducing construction energy in building as well as non-renewable resources. Thus builders, management and designers, are also to be responsible for increasing the recyclable material contents of building, waste generation and detoxification to produce an eco-friendly by-products (Amusan *et al*, 2015).

Introduction of New Construction and Maintenance Concepts

The penetration of new technology and design concepts, construction and maintenance of infrastructure, will produce an economic and environmental valid construction products. Therefore, synergic approach in this respect, among designers, builders, and material manufacturers is needed to produce advanced products. The development and incorporation of subsystems however should not be cost intensive, the application should be flexible and environmentally compatible and sustainable. New concepts in maintenance should be introduced; introduction of Total Maintenance Operation Management (T. M. O. M.) is advocated. T. M. O. M. is a technique that involves appraising techniques used in maintenance of an item, with a view to establishing an optimised approach better in term of quality, and fair in term of cost and as well pliable in the aspect of environmentally friendly by-products (Amusan *et al*, 2015).

Incorporating Eco-friendly Construction Materials

(Amusan *et al*, 2015) study reveals that people spent 80-85% of their time indoors, and most of the building materials often used in construction emits fumes and odour. The odour and emission from such are often poisonous, the effect can be carcinogenic or mutagenic, while other effects includes but not limited to the following: dizziness, memory loss, skin problem, respiratory tracts infection,

migraine, headache, allergies of diverse kind, disturbance in biological functions and damage of cellular growth and genetics and destruction of ecosystem (Sour and Yueng, 1993; Nadel, 2007). Therefore eco-friendly materials are needed in construction work in order to sustain life and structure that uses the construction products and bye products.

Effect of Incorporating Sustainability into Building Maintenance Practices

Abigo, Madgwick, Gidado and Okonji (2019) examine sustainable facilities management in the maintenance/management of public buildings in Nigeria and United Kingdom (UK), using information and data collected from literature, and two structured questionnaires, targeted at professionals and maintenance personnel in charge of the maintenance of public buildings in (UK) and Nigeria. Through this study, they addressed the need of integrating sustainable practices in the management of public buildings in Nigeria. In their findings, they reveal that as a result of no/poor maintenance strategies for maintaining public buildings, the average condition of public buildings in Nigeria is fair (on a scale 1 – poor to 5 – excellent), while due to good sustainable strategy for building maintenance practices in UK, the average condition of public buildings in UK is excellent (on a scale 0 – poor to 5 – excellent). Also, they discovered that the absence of regulations/legislations, sustainable policies, awareness, training of maintenance personnel, knowledge and senior management commitment are the most serve barriers to the implementation of sustainable facilities management in the management of public buildings in Nigeria.

The above research work is related to this present study in the sense that both studies are interested on sustainable building maintenance practices in Nigeria, though, Abigo *et al's* extended to UK. This extension, instantiate their difference. The two studies also differ in their method of gathering data for the study. While Abigo et al's gathered their data for their study through information from questionnaires and collected data from structured questionnaires. However, both studies recommend a framework for the implementation of sustainable practices in the maintenance and management of building in Nigeria (whether private or public buildings).

Consequently, Tunji – Olayeni, Mosaku, Oyeyipo and Afolabi (2018) investigates sustainability strategies in the construction industry, focusing on its implications on green growth in Nigeria using a quantitative research design. They gathered data for their study through questionnaires distributed to construction organisations in Lagos, Nigeria which were chosen using random sampling. Their findings reveal that many of the construction organisations surveyed do not have sustainability strategies because of low awareness about sustainability issues in construction. Also, in their findings, they discovered that among the three pillars of sustainability (environmental, economic and social sustainability), environmental sustainability was found to yield greatest benefit. Hence, they recommend that for the construction industry to contribute to Nigeria's green growth agenda there should be increased awareness of sustainability issues and institutional policies to drive sustainability.

The study of Tunji – Olayeni *et al* is related to this present study since, both studies concentrates on sustainability strategies. In addition, both studies gathered their data for the study through questionnaires. Nonetheless, both studies differ in that, their geographical locations are not the same – Nigeria, Tunji-Olayeni *et al's* state, where the research was carried out is Lagos state, while the present study's state is Anambra state. Again, their choices of research topic are not the same. The present study's research topic is 'evaluation of sustainability strategies for building maintenance practices in Nnamdi Azikiwe University Awka, Anambra State, Nigeria' while Tunji-Olayeni *et al's* own is 'sustainability strategies in the construction industry focusing on its implications on green growth in Nigeria'.

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 researcher's 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.

Data and Analysis

Table 1: Effects of Incorporating Sustainability into Building Maintenance Practices in Nnamdi Azikiwe University Awka

S/N	Variables	SA 5	A 4	U 3	D 2	SD 1	∑FX	Severity Index	Ranking
1	Decrease in the Repair Work to be carried out on the Buildings and Facilities	23	39	5	0	3	289	4.13	3rd
2	Prolonged Usefulness and Effective life of Buildings/Facilities and also, slows down the Rate and Timing of Decline	32	28	8	2	0	300	4.29	2nd
3	Minimise Cost while Maintaining same level of Service, that is Extra Cost of Repair and Replacement are reduced	36	24	7	1	2	301	4.30	1st
4	Value for Money	25	30	9	5	1	283	4.04	4th
5	Maintains the Operational Fitness of Buildings and Facilities by Timing and Adequate Maintenance	30	20	14	4	2	282	4.03	5th

Source: Researcher's Field work, 2019

Table 1 above revealed that minimise cost while maintaining same level of service, that is extra cost of repair and replacement are reduced (1st) has the most severe effect on incorporating sustainability into building maintenance practices in Nnamdi Azikiwe University Awka. Prolonged usefulness and effective life of buildings/facilities and also, slows down the rate and timing of decline ranked 2nd; decrease in the repair work to be carried out on the buildings and facilities; and value for money ranked 3rd and 4th respectively, while the least ranked (5th) is maintains the operational fitness of buildings and facilities by timing and adequate maintenance.

Conclusion

Incorporating sustainability strategies into building maintenance practices is a forward-thinking approach that delivers both environmental and economic benefits. Maintaining same level of service, that is extra cost of repair and replacement are reduced (1st) has the most severe effect on incorporating sustainability into building maintenance practices in Nnamdi Azikiwe University Awka. Sustainable maintenance not only supports regulatory compliance but also contributes to broader climate goals and corporate social responsibility.

Recommendations

1. The best sustainability strategies suitable for the maintenance of buildings in the study area should be adopted, as it will prolong the usefulness and effective life of buildings in the study area.
2. Regular inspections and upkeep reduce energy waste, prevent system failures, and extend equipment lifespan.
3. Provide regular training on sustainable practices and technologies to ensure effective and consistent implementation.

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