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Elimination of Waste and Inefficiencies in Existing Office Buildings in Developing Nations for Sustainability

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Abstract

A major reason why many developing nations hav not made significant advancement in sustainable development (SD) agenda is the neglect of existing building stock which forms the bulk of built assets. Although SD is a universal challenge, it cannot be approached in the same way for all nations, but rather practical response can be defined nationally or locally. This paper therefore looked into the possibility of using an improvement strategy model to eliminate waste and inefficient facilities in existing office buildings for sustainability in Nigeria and other developing nations from occupants and property managersô viewpoints, while emphasis is placed on the multi-stakeholder/interdisciplinary approach in which each professional in the built environment add discipline-specific data to a single shared model. Kaya (2004) observed that many writers have criticized the ignorance of end-user requirements during the construction briefing, highlighting the communications gap between the end-users, designers and owners, and that little had since improved. This paper suggests a way forward in which ñbottom-upò improvement policy formulation and subsequent implementation would stem from occupants and property managers rather than ñtop-downò governance approach in most developing countries. The concepts of lean thinking, green building and zero emission were incorporated into the Building Information Modeling to develop an improvement strategy model for office buildings with the condition that the use is retained, however, it can be modified for other types of buildings. It is envisaged that improvement (as against maintenance) would be cheaper financial-wise than to demolish and rebuild; environmental friendly; and bring about an appreciably reduced maintenance cost.

Keywords: *Sustainable development, waste and inefficient facilities, improvement, existing buildings, user's requirement, property manager.*

Introduction

The UN Earth Summit of 1992 in Rio de Janeiro, Brazil called on member States to adopt national sustainable development strategies that should build upon and harmonize the various sectoral economic, social and environmental policies and plans that are operating in their respective countries. However, over ten years after the target of 2002 set for their formulation and elaboration, many developing countries are still struggling to make significant advancement in sustainable development (SD). Jiboye (2009) observed that ñdespite efforts at both the local and international levels (in Nigeria)é current realities suggest that the goal of achieving sustainability in the country is yet to be realizedò. A major reason for this has to do with neglect of existing old buildings, as Wood (2006) noted: ñsustainability cannot be achieved without addressing the existing building stock. Even if every new building was a ósustainable buildingô, their impact on sustainability as a whole will be minimal for some time.ò This paper therefore looked into the possibility of using an improvement strategy model to eliminate waste and inefficient facilities in existing office buildings for sustainability in Nigeria and other developing nations. Jiboye (2011) wrote that, ñOne peculiar feature of governance in Nigeria is the use of Top-down approach to policy formulation and implementation.ò This paper seeks the opposite, whereby improvement policy formulation and subsequent implementation would stem from occupants and estate surveyors (who are trained property managers).

Background

The retrogressive trend witnessed in FESTAC Town, Lagos Nigeria once dubbed óLittle Londonô when it was built 36 years ago because of its state-of-the-art infrastructure had since sent tongues wagging questioning whether infrastructural maintenance is alien to the people. Okojie (2013) wrote: ñAs a mark of the countryôs penchant for lack of maintenance culture, the once beautiful town is now a shadow of itself, given the collapse of virtually all its infrastructure. Rather than finding lasting solution to the rapid decay of infrastructure in the estate, it has been accusations and counter accusations between the residents and management of the Federal Housing Authority (FHA). The Managing Director of FHAé blamed the deterioration of infrastructure in the estate on the residents who he accused of departing from the authorities original design and concept.ò The comment of the MD of FHA is thought provoking and it ushered in a vital dimension of sustainability i.e. if occupants depart from original building design (or carried out alteration/modification works, as it would seem in this case), then the accommodation (i.e. spatial arrangement) or other facilities offered were not meeting their needs and must have had elements of waste and inefficiencies.

Waste and Inefficient Facilities

The Advanced English Dictionary AED (2013) defined ñwasteò as ñany material unused and rejected as worthless or unwanted; a trait of wasting resourcesò, while ñinefficientò was defined as ñnot producing desired results, or lacking ability to perform effectivelyò. Ability itself was defined as ñpossession of qualities desired to get something doneò. Adopting these to built assets, ówasteô could be seen as those partitions within or without the building(s), which the occupants do not need or find useful, for example, multiple passageways or corridors in a building which could have been more useful to the occupants if converted to

store(s). Bullen & Love (2011) referred to such as ñinefficiencies in spatial layoutò. Thus, the improvement on the building design can eliminate such waste.

óInefficienciesô in built assets can also be seen as a building or its components not having the ability to function efficiently. An example is a building having two-ply sliding window in a humid and hot environment without provision for artificial ventilation; in such situation, the window can only provide a maximum 50% opening as compared to louvres that would provide up to 90% opening. Thus the former has more of aesthetic than functional value, which is the opposite for the latter. Therefore, the sliding window may be regarded as óinefficientô because it does not have the óabilityô to provide enough ventilation in the environment without further provision for artificial ventilation, whereas it can be more efficient in temperate regions or in built assets with further provision for artificial ventilation such as air conditioners. This problem is more pronounced in Nigeria as in many other developing countries where electricity supply is erratic, thus provision of artificial ventilation alone would still not solve the problem of the óinefficientô windows. The Nigerian architect is often criticized for giving more preference to aesthetics rather than functional value.

There is no doubt that there are a number of other factors and barriers that affect our ability to make our existing building stock more sustainable, however, until we are also able to address these two major issues of ówasteô, and óinefficient facilitiesô from occupantsô and property managersô viewpoints, the pace of SD in the developing nations will remain slow.

Why Improvement and not Maintenance?

This paper re-evaluated existing buildings and their role to sustainability through the improvement (as against maintenance) of their standards and it adopted the definition of óMaintenanceô as repair works carried out to restore a building to its original standard at construction, while óImprovementô is any work carried out to upsurge the initial standard of the building. Thus, maintenance reinstates the original standard, while in improvement; it is upgraded (see Fig. 1 below).

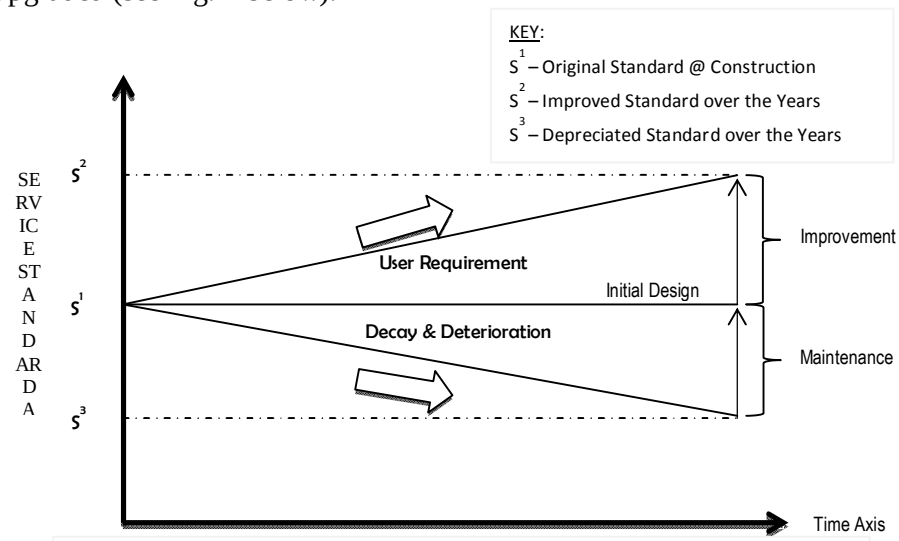


Fig. 1: Concepts of Maintenance and Improvement.

Wood (2006) pointed out that, ñA shortcoming of existing buildings is that they were constructed to the standards of the past, while standards, as measured by building regulations, have tended to increase over time in as far as they improve sustainability, both in quality and quantity. There is no requirement generally to bring existing buildings up to the standards applicable to new buildings; thus most existing buildings are some way below the standard of new buildings.ò Thus, while maintenance could address problems of deterioration and decay associated with physical obsolescence, it cannot solve problems of functional, economic and social obsolescence. Maintenance carried out on non-sustainable existing building can at best reinstate it to its original non-sustainable standard. Bullen & Love (2011) stated that, ñImprovements carried out during adaptive reuse were considered to provide the opportunity to link the performance of a building directly to the objectives of sustainability.ò

Improvement Strategy Terms

Varied terms are used for ñimprovementò in literature, however, in an attempt to produce consistency in this paper; such terms are not used except in relevant quotations. According to Brandon (2012), ñwe need a common language which allows us to communicate across related topics without fear of misunderstanding and across communities so that all feel fully engagedò. The ambiguous terms include the following:

*Adaptation:*According to Teo & Lin (2011), adaptation actions ñrange from minor maintenance to demolition and redevelopment.ò Ellison and Sayce (2007) observed that, ñFrequently terms like ñrenovationò, ñrefurbishmentò, ñremodelingò, ñreinstatementò, ñretrofittingò, ñrehabilitationò, and ñrecyclingò of buildings are incorporated.ò The term is simultaneously used for ñmaintenanceò, ñimprovementò and even ñdemolition and rebuilding".

*Refurbishment:*The AED (2013) defined the noun as, ñthe state of being restored to its former good conditionò; and the verb ñrefurbishô as ñto make brighter and prettierò. Thus, the noun describes maintenance, while the verb denotes improvement. According to Mansfield (2012), it is ñdisappointing as in many ways the term refurbishment has become a rather generic one and as such suffers from the lack of definitional precision that it both justifies and needs.ò Earlier, Mansfield (2011) noted that, ñAcross the literature there continues to be some confusion regarding the term refurbishment; many terms have been used as synonyms, including alteration, retrofitting, restoration, renovation and upgrading.ò

*Rehabilitation:*Rehabilitation means ñrestore to a state of good condition or operationò (AED, 2013), it is a term that suggests maintenance as Hui & Lau (2011) noted that, ñthe building rehabilitation may be an adequate strategy to maintain and restore dilapidated buildings.ô Hui, Wong & Wan (2008) wrote that, ñBuilding rehabilitation is an essential aspect of the regeneration of older urban areas and a cost-effective means of making our city sustainableò The term is used mainly for comprehensive urban renewal.

*Remodeling:*The AED (2013) defined remodeling as ñdoing overò which could easily stand in for improvement. However, it is a word used interchangeably with refurbishment, e.g. in Mansfield (2011), ñHistorically, professional consultants have considered refurbishment to be a technical exercise; a way to achieve internal space remodeling that can improve rental income and investment yields at a comparatively low capital costò, and with adaptation.

*Retrofitting:*According to Douglas (2006a), it is ñany work to a building over and above maintenance to change its capacity, function or performance. In other words, any intervention to adjust, reuse, or upgrade a building to suit new conditions or requirementsò. Wilkinson (2012) wrote that ñretrofit eventò covers all activity related to individual building permits on existing buildings, and can be referred to as alterations and extensions, upgrade, change of use and renovation.ò Apart from its ambiguity, it is mainly used for energy conservation and CO_2 emission reduction strategies. Mansfield (2002) said that, ñThere is a surfeit of terms used to cover retrofit such as adaptation, refurbishment, upgrade, conversion, renovation and exist in a ñstate of happy confusionò.ò

*Revitalization:*The AED (2013) defined the term as ñbringing again into activity and prominenceò. Mliczynska-Hajda (2007) said ñRevitalization, understood as an integrated set of long-term actions designed to radically improve a critical situation (permanent and deep degradation) in selected inner city areas that are key to a cityôs development, has for quite some time been recognized as an effective and sustainable instrument of introducing socially necessary and sustainable changes to urban areas. Its usage by Wang *et al.* (2013) also implied comprehensive urban renewal.

Concept of Sustainable Development

The concept of SD is a socio-ecological process characterized by the fulfillment of human needs while maintaining the quality of the natural environment indefinitely. This concept came into general usage following publication of the 1987 report of the Brundtland Commission - formally, World Commission on Environment and Development (WCED). It is this Commission, set up by the United Nations General Assembly that coined the most often-quoted definition of sustainable development (SD) which is ñdevelopment that meets the needs of the present generation without compromising future generations to meet their own needsò (WCED, 1987).

Pezzy (1989), in a paper for the World Bank, listed 60 published definitions of sustainable development, while Hartshorn *et al*. (2005) also noted that, ñé it is estimated that there are between 30 and 60 separate definitions of sustainability and that there is little agreement as to its meaning in practical or even theoretical terms.ò Gilmour & Banks, (2011) observed its abstruse meaning thus: ñé for many, sustainable development is often seen as a complex issue that is not definable in practical terms. The difficulty lies in defining sustainable development consistently owing to its very broad nature; often any definition occurs in political statements that are rather general and open-ended.ò According to Mansfield (2009), ñNotwithstanding the efforts of the EU Commissioners and national governments to provide a cohesive policy to address the negative impacts of sustainability or sustainable development, there is considerable difficulty in providing a consensus definition of these terms.ò

Slessor, cited in Abley & Heartfield (2001) said, ñAt best, Bruntland serves as a starting point but it hardly suffices as an analytical guide or policy directive.ò Hartshorn *et al*. (2005) went on to explain that ñA particular difficulty with the considerable disagreement over a precise meaning is that it obscures the political, philosophical and technical issues that remain

unresolved from the ñenvironment versus growthò debate.ò Lee and Huang (2007) also identified SD as the ñmost challenging and controversial issueò with respect to its interpretation and application.

Many writers agreed however, that the same approach cannot be used universally to achieve SD, for example, Rana (2009) observed that ñthe making and remaking of a sustainable city is a great challenge, particularly in the cities of the global South where urban population growth is unpredictable and even uncontrollable ... Therefore, the same goal of sustainable city will not be suitable in quest of sustainability in all cities of the world, while societal and cultural resources are different.ò Strzelecka (2008) however suggested that while SD is a universal challenge, practical responses should only be defined nationally and locally. Hence, it would be rational and sensible to say that developing nations should tailor responses to SD within their local environmental, economic and social extents in order to make significant advancement. This paper therefore suggests addressing the issue of SD from the perspective of occupants in public offices in the local context along the triple bottom line approach.

Literature Review on Improvement of Existing Buildings

Much of the building stock for the next century already exist and thus, to make a serious impact on improving sustainability, existing stock should be more fully considered. Wood & Muncaster (2012) observed that, ñThe rate and scale of improvements needed to existing buildings to ñsave the planetò are immense and extensive programmes are seen as necessary... The ñdeveloped worldò as a whole has huge numbers of buildings designed and constructed to standards that were barely adequate in their day and inadequate for today and tomorrow; and those in the developing world are even poorer.ò

According to Wood (2006), ñSustainability cannot be achieved without addressing the existing building stock. Even if every new building was a ñsustainable buildingò, their impact on sustainability as a whole will be minimal for some time.ò He went on to say that, ñNo building is an island. Buildings relate one to another and to the infrastructure, which links and serves them and their users. There are, for instance, cultural, heritage and physical links to be built upon and added to by new buildings and improvements to existing buildings.ò Hui, Wong & Wan (2008) added that, ñIn addition to the extension of the economic life of buildings, rehabilitation helps improve the living environment, increase property values, reduce the urgency for redevelopment, and enhance public safety and the image of city.ò Teo & Lin (2011) also wrote that ñthe level of adaptation a building shall receive always seems puzzling to property portfolio managersò, which this paper also addressed, mainly from occupantsô viewpoint.

A benefit of improvement as observed by many writers is that it will appreciably lower maintenance cost. Grigg (1988) observed that buildings steadily deteriorate and are not sustainable because ñmaintaining infrastructure is a constant and expensive process which often is neglected in favor of more attractive political goals.ò Kincaid (2002), in one UK study showed ñthat post retrofit office buildings had lower operating costs than prior to the retrofitò, while Suzuki, *et al*. (2010) explained that ñthe principles of sustainable development must take into account and carefully assess the costs of sustainable development investments by calculating and considering the óoperational costsô after construction is completed.ò

Another perception is that improvement is far cheaper than demolition and rebuilding. Shrestha *et al.* (2012) reported a retrofitting research finding in Indonesia that cost is less compared to the cost of demolition and rebuilding. Ma *et al.* (2012) observed that it is being considered as one of main approaches to achieving sustainability in the built environment at relatively low cost and high uptake rates. According to Bullen, (2007), ñAdaptation is inherently sustainable because it involves less material use, less transport energy, less energy consumption and less pollution during construction.ò Shipley, Utz and Parsons (2006) noted that ñIt is potentially cheaper to adapt than to demolish and rebuild inasmuch as the structural components already existò.

Improvement strategy is also perceived as environmental friendliness. Itard & Klunder (2007) found from a study that improvement generates less waste, uses fewer materials and probably uses less energy than demolition and rebuilding. Power (2008) argued that, ñthere are significant economic, social and environmental benefits of refurbishment in comparison to demolition. These benefits include reduced landfill disposal, transportation costs, greater reuse of materials, retention of community infrastructure.ò Gohardani & Bjork (2012) also observed that, ñbuilding demolition requires higher capital costs, the need for more aggregates and subsequent new build than refurbishment and further includes embodied carbon inputs, noise and disruption. Moreover, a greater transportation need for materials and waste is observed for building demolition which also involves a polluting impact of particulates.ò

Notwithstanding the evidences clearly supporting improvement, the decision-making process associated with whether to improve or demolish assets can be exacerbated by an array of interacting variables that converge around financial issues. Gohardani & Bjork (2012) observed that, ñDespite the exemplified disadvantages of demolition, avoidance of demolition within the existing building stock is uniformly impractical in certain cases.ò Douglas (2006b), of same opinion wrote that, ñDemolition is often selected when the life expectancy of an existing building is estimated to be less than a new alternative, despite any improvements that adaptive reuse may inject.ò

Despite contribution to the existing body of knowledge, these writers (and studies alike) fail to provide property managers with an ideal approach that can determine the desired improvement strategy in existing buildings, especially in the developing world with particular reference to waste and inefficiencies. This paper therefore intends to develop such model. With this tool, property managers are able to resolve the puzzle of which level of improvement they shall consider for a specific building; as a result, they can achieve near-optimal allocation of limited resources spent on building improvement, instead of giving in to different pressures due to intra-organizational politics.To make proper decisions connected with the improvement of office buildings, knowledge is required about possibilities of their conversion so that they meet the expectations of occupiers. It is therefore important to define the flexibility of the building in the sense of possibility of adaptation of the space to different needs.

Elimination of Waste and Inefficient Facilities Models

Four models that deal mainly with the issues of elimination of waste were examined during the literature review and they include (1) Lean Thinking, (2) Green Building, (3) Zero Emission, and (4) Building Information Modeling (BIM). The Integrated Whole Building Design (IWBD) model, which emphasizes the development of a holistic design and uses multidisciplinary collaboration, including key stakeholders and design professionals, from conception to completion was not considered, because it was designed for new builds, whereas this paper focuses on already existing buildings.

Concept of Lean Thinking

Lean thinking is an improvement model that emphasizes the identification and elimination of *muda* (Japanese word for waste) wherever it exists in a system, and that value is defined by the customer (end-user). According to Nicholas and Soni (2006), the two overarching philosophy of Lean Principles for sustainability is ñelimination of wasteò and ñcontinuous improvementò (or *kaizen* in Japanese). Wang (2011) explained that *Kaizen* is a system of continuous improvement in quality, technology, and safety among other things. The concept of *muda* (seen as the opposite of value) which became one of the most important concepts in quality improvement activities primarily originated from Taiichi Ohnoôs famous production philosophy of Toyota Production System (TPS) in the early 1950s. Ohno (1988) classified waste into seven types as shown in the table below (Nos. 1-7); many have however added the eighth - ñ*unused human talent*ò (e.g. Womack & Jones, 1996). This TPS in Japan later metamorphosed into what is now labeled as lean production and lean thinking by Womack et al. (1990). Table 1 shows the types of *muda* as applied in this paper:

Table 1: Different Types of Waste

S/No.	Type of Waste	Modified Description
1	*Transportation*	Distant location of complimentary offices causing unnecessary movements for users.
2	*Inventory*	Building materials kept for maintenance that are not necessary or have short life spans.
3	*Motion*	Poor ergonomic design affecting productivity, quality & safety e.g. walking, reaching, twisting.
4	*Waiting*	Delay, due to inadequate provisions for access to carry out maintenance activities, etc.
5	*Over-processing*	Adding design features not needed by users, e.g. bath tubs in general convenience; irregular office shapes thereby reducing functionality; etc.
6	*Overproduction*	Large accommodation space, too many corridors, etc. not needed or appreciated by users.
7	*Defects*	Defect in design: including inflexibility; wrong specifications leading to dampness, conditions suitable for fungi growth or attack, excessive condensation, corrosion and possibly electrical faults, etc.; inadequacies (e.g. conveniences, ventilation, lightening), etc.
8	*Human talent*	Non-inclusion of end-users' inputs & requirements in design, maintenance or improvement.

The concept of lean production had since been applied to a vast range of operation and processes in widely differing industries with tweaking of details, including the construction industry from where terms such as ñlean constructionò and ñlean designò emerged. Lean design and construction are fashioned after Lean Six Sigma, which is a set of tools and strategies for process improvement originally developed by Motorola in 1985. To undertake improvement activity in business (or building) processes in a systematic way using Lean Six Sigma, the useful framework is DMAIC (Dahlgaard & Dahlgaard-Park, 2006). It involves five phases, namely:

D*efine* the problem, the voice of the end-user, and the project goals, specifically.
M*easure* key aspects of the current design and collect relevant data.

A*nalyze* the data to investigate and pinpoint the areas for improvement. Attempt to ensure that all factors have been considered.
I*mprove* or optimize the current standard based upon data analysis.Here, various options are compared with each other at this stage to determine the most promising solution
C*ontrol:* the need to ensure that the goal is achieved and held. Putting a control plan in place is vital to ensure that the process is carried out consistently through feedbacks. There is also need for the design to be flexible.

Some organizations add a ***R****ecognize* step at the beginning, which is to recognize the right problem to work on, thus yielding an RDMAIC methodology. Jørgensen & Emmitt (2009) gave the following working definition for lean design and lean construction in their research work:
Applies a systemsô perspective to enhance value and eliminate/reduce waste and drivers of waste in the construction project;
Adopts customer (client/user/stakeholder) preference as the reference for determining what is to be considered value;
Approaches design and construction management through a focus on processes and flows of processes;
Adopts an understanding of design and construction/production activities from a perspective of three simultaneous conceptualizations, namely: transformation; flow; and value-generation; and
Manages design and construction/production processes with (end-user) demand-pull approach as far as this is applicable.

This paper adopted these working definitions together with the Motorolaôs quality improvement process ñsix steps to six sigmaò (with modifications) to create a model for improvement strategies for producing sustainable existing office buildings. It is termed ñ**Lean Improvement Strategy (LIS)**ò. The need for this model stemmed from the fact that much of what have been written about lean design is mainly for new build. According to Huthwaite (2007), the universal lean design equation is ñHow to create value and reduce wasteò, he also mentioned that one of the five laws of lean design is ñLaw of waste preventionò; however they were applied to new builds only. The modified steps from the Motorola Quality Improvement Process ñSix Steps to Six Sigmaò are highlighted in Table 2 below:

Table 2: Motorolaôs Quality Improvement Process ñSix Steps to Six Sigmaò

Steps	Motorola Lean Production Strategies	Proposed Lean Improvement Strategy
1	Identify the product you create or the service you provide to external or internal customers.	Recognize & define your service: Sustainable building standard.
2	Identify the customer for your product or service, & determine what he or she considers important.	Identify customers & their needs: End-users' requirements & property manager's observations thru POE.
3	Identify your needs to provide product or service so that it satisfies the customer.	Determine Cause-Effect Relationship: Analysis of data from Step 2 above.
4	Define the process for doing the work.	Determine the improvement options.
5	Mistake-proof the process & eliminate wasted effort & delays.	Eliminate waste and defects from the process.
6	Ensure continuous improvements by measuring, analyzing, & controlling the improved process.	Measure your results for continuous improvement (*kaizen*): Feedback and flexibility of improvement design.

Source: Dahlgaard & Dahlgaard-Park, 2006 (modified)

Concept of Green Building and Existing Buildings

According to Kozlowski (2003), a green building is one that ñuses a careful integrated design strategy that minimized energy use, maximizes daylight, has a high degree of indoor air quality and thermal comfort, conserves water, reuses materials and uses materials with recycled content, minimizes site disruptions, and generally provides a high degree of occupant comfort.ò Green Building mainly represents climate-friendly buildings that consume lower energy and with low CO_2 emission and according to Miller & Buys (2008) ñmuch less is known about how green building initiatives might be incorporated into existing buildings, which make up the bulk of the market. If the challenge of climate change is to be successfully addressed, therefore, this vast stock of older buildings (developed decades ago when sustainability was not a consideration) needs to be retrofitted.ò

This paper did not address all the requirements of a green building, but the suggestions would give relevant information on how to improve day lighting, air quality, thermal comfort, conservation of water and occupantsô comfort thereby producing green buildings from existing stock. Rey (2004) noted that ñit is not contradictory to aim simultaneously at a coherent esthetical approach, a reduction in energy consumption and an improvement in comfort.ò

Concept of Zero Emission and Existing Buildings

The Zero Emission concept postulated by Pauli Gunter represents a shift in our concept of industry away from linear models in which wastes are considered the norm, to integrated systems in which everything has its use; it advocates for ñcomplete elimination of wasteò (Gunter, 1998). In this way, industries will reorganize into "clusters" such that each industry's wastes/by-products are fully matched with others' input requirements, and the integrated whole produces no waste of any kind (www.zeri.org). This paper incorporates this concept, through identification of waste and inefficient facilities in the design of existing office buildings and their conversion to other uses.

The Building Information Modeling (BIM)

BIM (see Fig. 2 below) facilitates the creation of models which serve as a virtual representation of the actual construction process, by matching each step with a frame by frame real time representation; each professional adds discipline-specific data to the single shared model. According to Eastman *et al*. (2008), ñThe resulting building information models become shared knowledge resources to support decision-making about a facility from earliest conceptual stages, through design and construction, through its operational life and eventual demolition.ò Traditional building design was largely reliant upon two-dimensional drawings (plans, elevations, sections, etc.). BIM extends this beyond 3-D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension and cost as the fifth (wikipedia.org/wiki/Building, 2011).

Alufohai (2012) noted that, ñThe move to adopt BIM in Nigeriaôs private and public sector and amongst different building professionals (Architects, Quantity Surveyors, Civil

Engineers, etc.) has been very slow. Architects have adopted but mainly for enhancing the visual quality of their presentation.ò

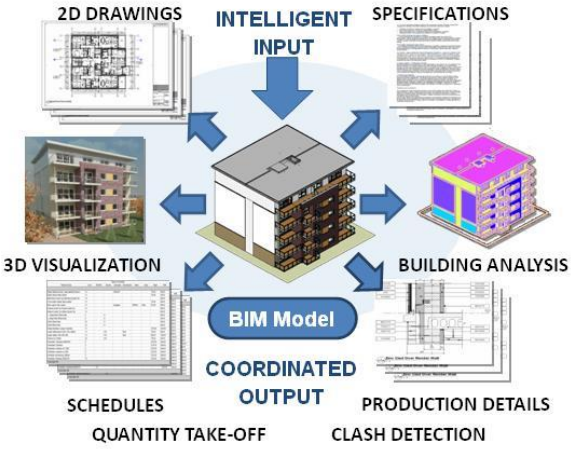


Fig. 2: BIM Model. Source: www.wspgroup.com (2013)

The Role of the Estate Surveyor in SD

The property manager's role in the SD process includes commenting on the way proposals are likely to affect the future welfare of the building project, in particular, (s)he is concerned with the management, maintenance and financial consequences of investment decisions. According to Johnson, Davis, & Shapiro (2005), immediately after the architect had produced his proposal, the in-house property manager should normally be asked to comment and in doing so, he will first satisfy himself that the proposals contain no hidden danger: which include high windows openable by young children; wide stairwells with climbable balusters; blind corners on roads where children might play; and other menaces to safety. Secondly, he will look at the plans to ensure that they are not likely to give rise to expensive maintenance or difficulties in supervision and control. Finally, he will be conscious of cost. The form a development might take has an important bearing on the management problems which will emerge in the completed scheme and each detail of the embryo project must be examined to ensure that it will not give rise to dangers, difficulties of control or nuisance to the occupiers, adjoining owners or the public at large.

The involvement of the estate surveyor in building projects will help to address issues from the maintenance point of view and will be guided by the principle of cost-in-use in tendering advice on the suitability of forms of construction, layout and finishes (Belo & Agbatekwe, 2006). He will also try to ensure that the building project will be suited for its intended use. His role cannot be over-emphasized because the financial result of development decisions is, of course, the responsibility of the entire development team, but the consequence of failure will remain with the estate surveyor after the other team members cease to be concerned with the scheme, shortly after the physical completion.

As a professional, he will therefore try to ensure that the future is not prejudiced by unwise investment or by facile solutions, but unfortunately in Nigeria as in many other developing countries, the estate surveyor is usually excluded in the development process. However, this

paper suggests that he can still find a role in SD; in the improvement of existing building stock.

Property Management (PM) and Facilities Management (FM)

According to Yiu, Wong & Yau (2006), the PM profession has developed for over half a century, but interestingly nobody has questioned its definition and origin until the emergence of FM, which now stimulated debate on its distinctions from FM. A simple question comes to mind: ñIs FM usurping the historic role of PM?ò

Both the International FM Association and British Institute of FM (in Shah, 2007) defined FM as a profession that encompasses multiple disciplines to ensure functionality within the built environment by integrating people, place, process and technology. Thus, since FM emphasized ñthe integration of multi-disciplinary activities within the built environmentò, it should not be seen as a hijack of PM services, but rather, an embrace of professionals thereby producing synergy for sustainability. PM can be said to have been embedded in FM and it goes to say that the property manager (or the estate surveyor) is one of the professionals whose services is recognized and welcomed by FM. This paper appreciates the fact that the estate surveyor cannot supply all the details needed to implement a sustainable improvement strategy for existing buildings (either as a property manager or facilities manager), but his role will complement those of other professionals identified in the built environment for sustainability to be successful.

Stone (2005) identified three stages in improvement process, namely: The Analysis, the Strategy and Tactics stages respectively. He went on to say that ñthe analysis of the existing building provides the principles or basis of the argument for the remodeling of a specific place. This understanding can generate the strategy and tactics of the redesign.ò This paper suggests that the estate surveyor can generate the information needed for the analysis stage while the technical details for the latter stages would be provided by other professionals in the built environment, especially the designers ï architects and engineers, for the simple reason that they are better qualified to do so. Scott (2008) observed that ñFor any refurbishment programme, the scale and nature of interventions can only be ascertained after gaining detailed knowledge of the host building.ò

Occupants' Satisfaction

Kaya (2004) observed that many writers have criticized the ignorance of end-user requirements during the construction briefing, highlighting the communications gap between the end-users, designers and owners, and that little had since improved. This paper intends to bridge this communication gap by also highlighting the importance of interaction with end-users in order to identify their requirements in public offices. Black (2008) observed that world class companies have intense customer focus in which the customer is an indispensible part of the process. He gave the example of Boeing who involves customersô views in its production process in what is termed ñaggressive listeningò. The construction industry should also focus on end-users satisfaction to create world class facilities.

According to Love & Bullen (2009), ñCurrent assessment systems do not provide a full profile of sustainability because they tend to exclude input from building occupants.ò Schwede *et al*. (2008) argued that workers would be more satisfied with a new or recently upgraded work environment and that there are indeed many instances of increased productivity resulting from environmental enhancements. Therefore it can be assumed that occupantsô participation in the change design process as well as the consideration and continuity of successfully adapted environmental features, as suggested by Speckelmeyer (1993), lead to especially successful environments for specific organizations. Shika *et al.* (2012) observed that ñTo achieve sustainability objectives in buildings, a coherent strategy and action plan is needed to address occupantsô expectations and needs in existing buildings.ò

This paper also took a cue from Schwede *et al.* (2008) in their research work on Occupantsô satisfaction with workplace design in new and old environments used some factors to rate workspace design and management of existing buildings. They include: (1) Workspace layout; (2) Size of personal workspace; (3) Personal work surface area; (4) Workspace storage; (5) Meeting rooms; (6) Social spaces; (7) Suppression of noise; (8) Visual disturbance; and (9) Access to privacy, among others.

Post-Occupancy Evaluation (POE)

According to Shika *et al.* (2012), to achieve sustainability objectives in buildings, a coherent strategy and action plan is needed to address occupantsô expectations and needs in existing buildings, thus this paper suggests the use of POE. The tool allows for occupants to provide direct feedback on the performance of the building and how it meets their needs. Watson (2003) defined POE as ña systematic evaluation of opinion about buildings in use, from the perspective of the people who use them. POEs are generally aimed at conveying the parameters of buildings that work well and also at focusing on the ones that should not be repeated in future building designs.ò POE assesses how well buildings match usersô needs, and identifies ways to improve building design, performance and fitness for purpose. According to Shah (2007) ñThe POE is performed using a questionnaire to gain a direct feedback from the occupants, and uses these experiences as the basis for evaluating how a building works for its intended use. It can be used for many purposes, including fine-tuning new buildings, developing new facilities and managing ôproblemô buildings.ò

Nawawi & Khalil (2008) observed that POE of buildings is ñvitally needed to ensure that building performance of government and public buildings and facilities is sustained.òOnce occupantsô satisfaction and expectancies are known and analyzed, areas to change and those to improve can be identified and subsequently resolved. The three phases in a typical POE include: Preparation; Interviews; and Analysis and Reporting.

Proposed Lean Improvement Strategy for Existing Office Buildings

The proposed model (Fig. 3) took in information from the varied literature review in the following steps:
Step 1: The problem as recognized is ñSustainability of Existing Office Buildingsò with respect to usersô facility requirements in terms of a gap between what is and what should be.

Fig. 3: Proposed Lean Improvement Strategy for Existing Office Buildings

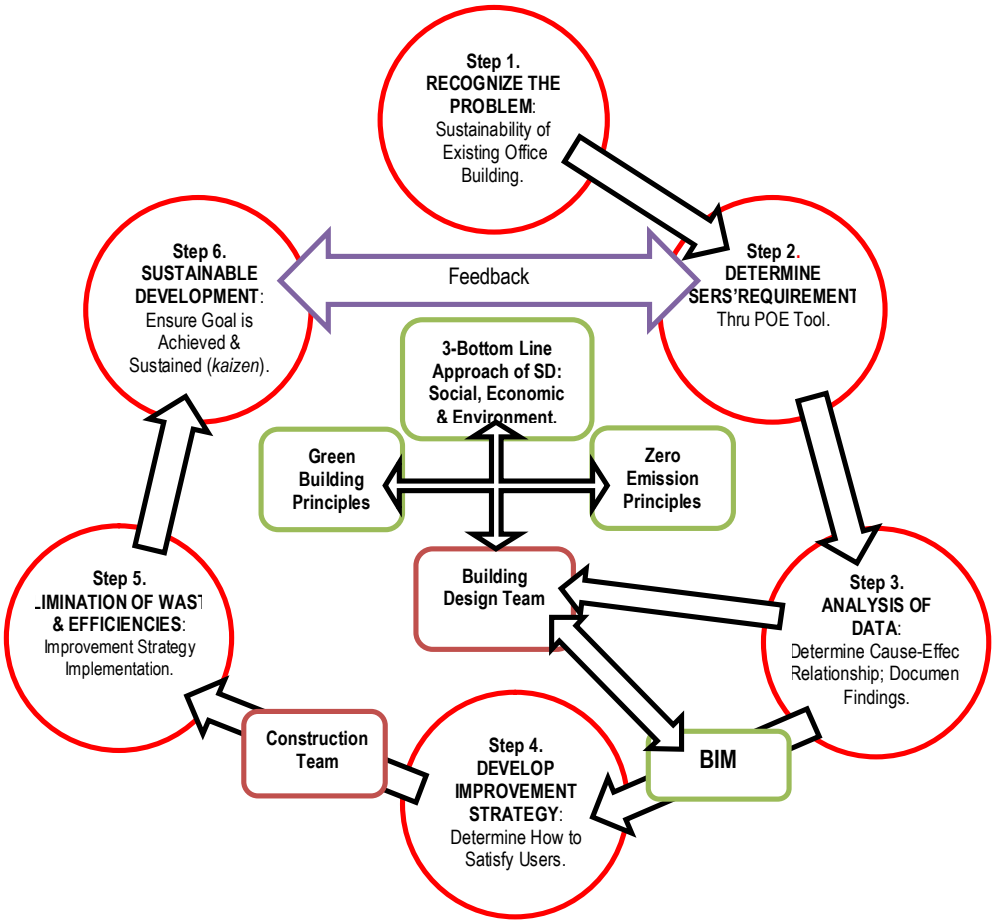
Step 2: Determination of recognized usersô requirement, using POE tool. Users include employees, patrons and visitors alike. Major steps include identification and selection of participants for questionnaires and interviews, however, the estate surveyor add his observation to data collected. Design data collection instruments; collect the data and summarize what you have learned about the variable's effects on the problem; determine what additional information would be helpful at this stage through observation by the estate surveyor.

Step 3: The data collected in step 2 and the experience of the end-users is analyzed, documented, and used to determine cause-effect relationship and potential causes of the current conditions. Determine whether more data are needed: if so, repeat step 2. It would afterwards be fed into the BIM and to other members of the design team to consider. The building team will equally incorporate the principles of SD, Green Building and Zero Emission into their designs which are also fed into the BIM.

Step 4: Through the BIM, an improvement strategy is produced that would be used to satisfy usersô requirements among other things. From a list of possible strategies, a decision will be taken on which solutions to be tried. Careful assessment of the feasibility of each strategy and potential adverse consequences will be considered also. Reason(s) should be advanced for choosing a particular strategy. Will there be a pilot project?

Step 5: The implementation of the preferred strategy through the activities of the construction team will eliminate waste and inefficient facilities from the building structure for sustainability.

Step 6: Control, to ensure that goal is achieved and sustained (*kaizen*). The flexible improvement strategy would be used to accommodate feedback through regular POE in step 2.



It is necessary that the use is retained for this model to be valid. It was designed to highlight the roles of the end-users and the property managers in the sustainability of existing office buildings through improvement strategy; these two groups of stakeholders have been neglected in the quest for SD. The model had also emphasized the multi-disciplinary role involved in SD. However, it can be adopted for other types of property with little modifications.

Conclusion

There is difficulty amongst writers in providing a consensus definition for SD; however, there seem to be an agreement that though it is a universal challenge, it cannot be approached in the same way for all nations, but rather practical response can be defined nationally or locally, while emphasis is placed on the multi-stakeholder/interdisciplinary approach by incorporating the views of end-users and property managers to policy making and implementation for the sustainability of existing built assets.

An improved office would have a major impact on productivity. The lean improvement strategy will be cheaper financial-wise than to demolish and rebuild; environmental friendly; and bring about an appreciably reduced maintenance cost. However, despite the exemplified disadvantages of building demolition, avoidance of demolition within the existing building

stock is uniformly impractical in certain cases. The concepts of lean thinking, green building and zero emission were identified as having the principles of identification and elimination of waste wherever they appear, and they have been incorporated in the model to achieve sustainability, while the BIM allows each professional to add discipline-specific data to the single shared model.

Alufohai (2012) wrote on the implementation of BIM in Nigeria thus:
The main challenges regarding cost management (in Nigeria) are poor budgeting and corruption. Projects are designed and contracts awarded on designs whose costs are not properly calculated. This often results in abandoned projects on which considerable resources have been committed and spent. An example is a Federal Secretariat Complex in the capital city, Abuja that was abandoned after it was discovered that building a vast underground car park was too expensive. Building projects in Nigerian are often a source of corruption. This often involves wild inflation of costs. The adoption of BIM will greatly enhance transparency, allowing different stakeholders (bidding contractors, parliament, civil society organizations etc.) have a better idea of true project costs and the financial implications of variations.

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