ADOPTION OF GREEN DESIGN IN INSTITUTIONS OF HIGHER LEARNING IN AFRICA

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ABSTRACT

The construction and operation of buildings contributes many environmental impacts, from the generation of solid waste during construction to the production of carbon dioxide from occupant energy use. In recent decades, there has been a focus on examining the physical condition of the nation's public school buildings, and the quality and condition of these learning environments continue to be a topic of concern. Identifying opportunities to reduce these emissions has become a priority in the global effort to reduce climate change.

Improving the environmental performance of buildings is critical to larger sustainability efforts. Green design is advocated and developed in response to the increasingly deteriorating global environment, but its implementation is only based on the morality of the entrepreneurs, without economic incentive and legal restraint.

As a result, green design has not been widely adopted. Even though the government has enacted and put in place various environmental laws, regulations and policies such as the National Environmental Policy, the Physical Planning Act, the Local Authority Building Code, the Occupation Safety and Health Act to promote sustainability in the built environment, the regulatory approach adopted by government agencies does not seem to promote uptake. How institutions of higher learning in Africa should respond to this trend is a concern of this study as will be observed in Kenyan Public Universities.

Key words: Green Design; LEED; Occupation Safety and Health Act (OSHA)

INTRODUCTION

The overall objective of this research is to examine the adoption of green design in institutions of higher learning in Africa as will be observed in Kenyan public universities. Specifically, the study will assess the effect of urban planning**,** architectural design and interior design on the adoption of green design in institutions of higher learning in Africa. This will be anchored on relevant theories, which include the Adoption and Diffusion Theory, Sustainability Theory, General System Theory and the Theory of Planned Behavior.

This study shall adopt a descriptive design. The study population will consist of include Architects, Quantity surveyors, Property Managers and Engineers.

The study will use multi-stage sampling where Fisher, Laing &Stockel formulae for determination of sample size will be used followed by stratified proportionate sampling in selecting the respondents to give a convenient sample size of 230 respondents. A questionnaire will be administered as the primary data collection instrument which will comprise of open and closed ended questions.

A pilot test will be carried out to test the validity of the instrument. Cronbach alpha coefficient will be used to test reliability; while validity will be tested by discussion with the experts including supervisors and colleagues. Data collected will be analysed using Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics and inferential statistics such as Pearson's correlation and Multiple Regression analysis will be used in analysing data. This will assist in determining the level of influence the independent variables have on the dependent variable.

Analysed data will be presented using tables and graphs. The study shall summarize key findings,

PROBLEM FORMULATION

Green design is advocated and developed in response to the increasingly deteriorating global environment, but its implementation is only based on the morality of the entrepreneurs, without economic incentive and legal restraint.

As a result, green design has not been widely adopted. In recent years, the European countries, the U.S., Japan, the UN and Taiwan have successively promoted green designs and construction guidelines (Mollaoglu, Chergia, Ergen & Syal, 2016).

Whereas advantages of adopting green construction exist, the approach is not being adopted by Kenyan construction industry practitioners and developers as would have been expected.

Out of an estimated 293 completed projects in Nairobi between the year 2010 and 2011 only about four can be said to have adopted Green construction concepts. The construction of commercial buildings has continued to grow within Nairobi and unless appropriate measures are put in place, development of unsustainable buildings will not stop (Were, Diang'a and Mutai, 2015).

Even though the government has enacted and put in place various environmental laws, regulations

and policies such as the National Environmental Policy (GoK, 2012), the Physical Planning Act, the Local Authority Building Code, the Occupation Safety and Health Act (OSHA) to promote sustainability in the built environment, the regulatory approach adopted by government agencies does not seem to promote uptake. Green buildings are marketed as economical (Issa, Mohammed, & Christian, 2011) apart from using new technologies (US Environmental Protection Agency, 2009) yet only four buildings are said to be green in Nairobi.

How institutions of higher learning in Africa should respond to this trend is a concern of this study as will be observed in Kenyan Public Universities.

RESEARCH OBJECTIVES

1. To investigate the effect of urban planning on the adoption of green design in institutions of higherlearning in Africa.
2. To establish the extent to which architectural design influences the adoption of green design ininstitutions of higher learning in Africa.
3. To determine the influence of interior design on the adoption of green design in institutions of higherlearning in Africa.

RESEARCH METHOD

This study adapts descriptive research method conducted between December 2017 and April 2018 through survey design. The method consists of collecting information by interviewing or administering a questionnaire to 230 respondents which include Architects (20.6%), Quantity surveyors (30.6%), Property Managers (23.4%) and Nairobi City County Engineers (25.5%). We get the convenient sample size of 230 respondents by using multi-stage sampling given by Fisher, Laing & Stockel formula:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2(N-1) + z^2 \cdot p \cdot q}$$

where n is sample size; **N** is the total population (assume 560); **e2** is acceptable error (the precision level at 0.05); **p** is the proportion in the target population that assumes the characteristics being sought (In this study, a = 50:50 basis is assumed which is a probability of 50 percent (0.5)); **q** is the balance from p to add up to 100 percent (That is 1-P (1 - 0.5), which in this case is 100 - 50 percent (0.5)); **z2** is number of standard deviation units of the sampling distribution corresponding to the desired confidence level of 95 percent which is 1.96.

Further, stratified random sampling technique is used to select the sample. From each stratum we use the percentage obtained in the population to come up with the exact number of respondents from the different stratums.

The questionnaire we administrate by using drop and pick method as primary data collection instrument which will comprise of open and closed ended question.

We carry out a pilot test to test the validity of instrument. Cronbach's (1951) alpha coefficient will be used as a quality indicator of the scale items. Cronbach's alpha value of 0.7 is considered as the minimum acceptable threshold of questionnaire reliability (Hair *et al.*, 2010).

Finally, we analyze the collected data using Statistical Package for Social Sciences (SPSS) version 22. In addition, a multiple regression analysis and correlation coefficient analysis will be carried out to examine the Adoption of green design in institutions of higher learning in Africa as will be observed in Kenyan public universities.

The public universities have been chosen because they have the knowledge required in employing green design in buildings while they have not yet adopted the same in their institutions.

The regression equation to be employed is as follows:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \varepsilon$$

where Y is adoption of green design in institutions of higher learning in Africa, β_0 is constant terms, β_{1-3} is Beta coefficients, X1 is urban planning, X2 is architectural design, X3 is interior design and **ε** is error term.

CONCLUSIONS

The study concludes that urban planning is significant and has a positive relationship with adoption of green design. Most urban buildings are densely constructed and prevent air movement after construction. Planning the site is significant element of sustainable building as the construction process has a significant impact on several sustainability aspects. Most of the time large green areas are destroyed instead of integrating them in the built environment. This calls for an improvement of the green space planning approach through:

1. Consideration of the multi-functionality of urban green space at lower, as well as higher,planning levels;

2. Increasing the physical connection between urban green spaces and the integration of theplanning concepts at different planning levels;

3. Gradually promoting an open planning system with stakeholder involvement and publicparticipation; and

4. More balanced considerations of ecological, social and economic components from alongterm perspective of sustainable development.

On architectural design, the study concludes that it affects adoption of green designs. This is due to the fact that green architecture is an architectural style that incorporates environmental design into planning, design and execution of buildings in an integrated rather than interventionist way. It incorporates all environmental building physics principles, namely: natural ventilation / passive cooling; thermal comfort; solar shading; room acoustics and day-lighting. Three of most frequently discussed and accessed green indexes include: green index, daily energy-saving index and water resources index.

The study also concludes that it is important for the relevant authorities to acknowledge that wider scoping networks are now required to embrace the various aspects of green architectural designs.

Regarding the interior design, the study concludes that interior designers that practice sustainable design through a holistic approach can positively impact the building occupants, the community, and the environment. This is a significant solution when designing learning institutions buildings because it is the interior designers' social and moral responsibility. The outcome of their learning institutions designs should create spaces that are functional, safe, comfortable, and healthy.

Acknowledgements:

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