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Green Building Delivery: Approaches for Bridging the Skills Gaps

Oluwole Joseph Oni
Department of Quantity Surveying, Federal Polytechnic, Ado Ekiti, Nigeria

Abstract
The current global campaign for sustainable development demands that meeting housing and infrastructural needs of the people should be implemented in tandem with sustainability philosophy. Green building delivery is one of the major ways to drive the sustainable development agenda within construction sector. However, in many developing countries of the world, this effort is faced with a number of challenges among which inadequate capacity for design and delivery of green building projects is prominent. Therefore, this study investigates skills challenges limiting the delivery of green buildings in South Western Nigeria. The study employs questionnaire survey, a quantitative technique to collect data from the respondents. A total of one hundred (100) questionnaires were administered and eighty (80) retrieved. The ensuing data was analyzed using mean score and relative importance index (RII). Results indicate that there is a shortage of green building technicians such as green site supervisor, quality controller, geothermal experts, energy auditors among others. It was found also that green capacity development is low in the study area. The study concludes with a set of strategies for bridging the skills gap in order to accelerating the delivery of green buildings.

Keywords: Delivery, Green buildings, Technicians, Training, Skills gap.

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I. Introduction

Most developing countries of the world are faced with the challenges of enormous housing and infrastructure deficit and fast growing population among others. Therefore, building and infrastructure delivery remain the major concern in these nations (Du Plessis, 2007). Green building forms a subset of the global sustainable development agenda. Green buildings consume less energy, water and natural resources compared to the convectional buildings. They also create less waste and provide healthier living environment, further they incorporate features such as efficient use of water, energy efficient and eco-friendly environment. The buildings use renewable energy and recycled materials, embrace effective use of landscape and have improved indoor quality for health and comfort (Roy & Gupta, Cost efficiency of Green Buildings in India, 2010). Cedefop, (2012) argues that 'green' building is a building that, in its design, construction or operation, reduces negative impacts, and can create positive impacts, on our climate and natural environment. Green buildings preserve precious natural resources and improve our quality of life. Any building can be a green building, whether it's a home, an office, a school, a hospital, a community center, or any other type of structure, provided it includes features listed above.

The construction industry is at the very centre of the global challenge in the transition from the traditional way of development to a sustainable economy development agenda. The implications of this are that more commitment is required from the industry stakeholders to respond to challenges slowing down the delivery of green buildings. Sustainable development agenda and by extension, green building delivery require new skills. This is because transition to the green economy is a process where green jobs become a moving target. Providing the skills required to drive sustainability may create entirely new occupations, or for a very distinctive new specialization or set of new skills within an existing occupation. There is little evidence in extant literature on the advancement made in skills concerns for green building delivery by the developing countries of the world. Therefore, the objective of this study is to investigate the skills gaps impeding the delivery of green buildings in Nigeria particularly and to propose appropriate strategies for bridging the gaps.

Green Building

The concept of green building concerns the responsibility of the construction sector of creating the built environment in a sustainable manner (Pearce et al, 2012). That is, in a way that is environmentally friendly, socially responsible and economically supportive. Green building is centred on the economic, social, and environmental impact of creating a usable structure. Given that the construction sector is responsible for a large proportion of energy and material consumption, biodiversity loss, waste generation and pollution (CIOB, 2004).

It therefore requires all stakeholders (designers, professionals, contractors and the clients) to imbibe construction practices that will minimize the damages done to the environment. McMahon *et al*., 2015 posits that adoption of green buildings minimizes the use of raw materials and land, reduces energy and water consumption; and that emissions, waste and pollution in the environment are also brought down significantly. It is disturbing to note that housing and infrastructure delivery approach in many developing nations is paradoxical. On one hand, they attempt to meet the housing and infrastructural needs of their people; on the other hand these activities are plundering the environment, harmful socially and economically destructive. Given the serious attention focused on sustainability globally, it is necessary also that the developing countries accord the much needed response to it. However, Thorpe and Ryan, (2007) argue that there is therefore the need for a responsive and viable construction sector to drive the implementation process.

II. Research Methodology

The research design for this study is quantitative research design using questionnaire survey. A well-structured, five point Likert scale questionnaire was designed as the research instrument used for data collection in order to achieve the research objectives Cedefop, (2012). The questionnaires were administered to the respondents by hand given the low penetration of the internet in the study area. The researcher made further efforts to increase the response rate as suggested by Babbie and Mouton (2005) by making telephone calls and sending electronic messages to the respondents. For the analysis of the data obtained for this research, Statiscal Package for Social Science (SPSS) software was employed. Descriptive statistics were used; and specifically, Means Score (MS) and Relative Importance index (RII) were the tools utilised in the analysis. As earlier indicated, a five-point Likert scale was used, and the extent of the ranges of each step in the five-point Likert scale continuum was calculated by dividing the number of continuums, which is 4.00, by the 5 relative points. Therefore the ranges between the relative points equates to 0.80. The mean score was computed for each factor and the value was compared to suit the relative range it fell under. The Mean Scores are denoted by (MS). The statistics include frequencies, means and mean scores (MS). The mean is derived by allocating values to the ratings factors of the respondents.
The ranges relative to the mean scores are defined in the Table 1 below:

Table 1: Guide for the interpretation of results

Mean score range	**Meaning**
MS > 1.00 ≤ 1.80	Strongly Disagree (SD)
MS > 1.80 ≤ 2.60	Disagree (D)
MS > 2.60 ≤ 3.40	Neutral (N)
MS > 3.40 ≤ 4.20	Agree (A)
MS> 4.20 ≤ 5.00	Strongly Agree (SA)

The results are presented as follows:

III. Results And Discussion

From Table 2 below it can be observed that 36.25% of the respondents were Architects , 5% were builders, 17.50% Civil Engineers while 15%, 21.25% and 5% were Quantity Surveyors, Urban Planners and Land surveyors respectively. In terms of respondent qualifications, 33.75% of the respondents are were ND holders, 48.75% were HND/ BSc holders, 12.50% of the respondents were Master's degree while only 5.00% of the respondents hold PhD . Regarding years of experience, 13.80% of the respondents have 1-5years of experience, 40.00% have 6-10years of experience, 25.00% of the respondents have 11-15years, while 16.20% and 5.00%and have 16-20 years and above 20 years of experience respectively.

TABLE 2: DEMOGRAPHICS OF THE RESPONDENTS

Demographics of the Respondents		
Variables	No of Respondent	Percentage (%)
Profession		
Architecture	29	36.25
Building	4	5.00
Civil Engineering	14	17.50
Quantity Surveying	12	15.00
Urban Planning	17	21.25
Land Surveying	4	5.00
Highest Qualification		

ND	27	33.75
HND/ BSc	39	48.75
Masters	10	12.50
PhD	4	5.00
Total		
Years of Experience		
1-5 years	11	13.80
6-10years	32	40.00
11-15 years	20	25.00
16-20 years	13	16.20
20 years and above	4	5.00

Source: Field survey, 2019.

From Table 3, it can be observed that the respondents were requested to rank from 1 to 5 (i.e strongly disagree, disagree, Neutral, Agree, Strongly agree) as shown in table above by rank and the means of each of the skill were computed and used to rank the methods with respect to their significant contribution to the specific tradesmen/artisans needed for delivering green buildings. From the result which is shown in table 4.1 above, the most rated skill is Building Site Supervisor with mean 5.53, while Inspector and Quality Controller with mean 4.85 is second rank, while Building Service and Urban Planners were also ranked with mean 4.78 and 4.75 respectively. While others skills by their mean were ranked in ascending order of magnitude and also categorized as the least common skills needed for delivering green buildings in Nigeria.

It can be concluded that all these tradesmen/artisans listed above are all needed for delivering green buildings since most of the respondents were strongly agree and agree that all have important role to play in each cases.

TABLE 3
SPECIFIC TECHNICIANS / EXPERTS NEEDED FOR DELIVERING GREEN UILDINGS

SPECIFIC SKILLS	SUM	∑FX	MEAN	RII	RANK
Building Site Supervisors	80	443	5.53	1.11	1st
Inspector and Quality Controllers	80	388	4.85	0.97	2nd
Building Services technicians	80	383	4.78	0.96	3rd
Urban Planners Technicians	80	380	4.75	0.95	4th
Training Facilitators	80	378	4.72	0.94	5th
Architectural technologists	80	371	4.64	0.93	6th
Geothermal Technicians	80	367	4.59	0.92	7th
Insulation and Weatherization Technicians	80	358	4.47	0.89	8th
Plumb Heating Installers	80	354	4.42	0.88	9th
Electricians and IT technicians	80	351	4.38	0.87	10th
Heat Pump Installers	80	347	4.33	0.87	10th
Installer of Complex Systems for Buildings	80	344	4.30	0.86	12th
Energy auditors	80	343	4.28	0.86	13th

Source: Field Survey, 2019

From Table 4, it can be observed that Lack of assessment of craft workers Training Needs with mean 4.80 is ranked first, while Inadequate government policy promoting Green Building with mean 4.65 ranked second; while wrong choice of training/instructional methods by trainers with mean 4.63 is the third rank. Lack of opportunity to acquire relevant skill for delivering Green Buildings with mean 4.61 is ranked fourth; Unwillingness on the part of the craftsmen to acquire indepth knowledge/ skills in the chosen trade and Aging of skilled workforce in the industry with mean 4.58 respectively were ranked together because they have the same mean score. While Need to upgrade managerial and technical skills, High Cost of Training Construction Craftsmen and Rapid changes in the technologies with mean 4.48 respectively. These factors were ranked in the same manner, because they have the similar mean, while other factors were rated lower impact.

TABLE 4: FACTORS IMPACTING THE KNOWLEDGE AND SKILLS NEEDED FOR DELIVERING GREEN BUILDINGS

FACTORS	SUM	∑FX	MEAN	RII	RANK
Lack of Assessment of Craft Workers Training Needs	80	384	4.80	0.96	1st
Inadequate Government Policy Promoting Green Building	80	372	4.65	0.93	2nd
Wrong choice of training/instructional methods by trainers	80	371	4.63	0.93	3rd
Lack of Opportunity to Acquire Relevant Skill for Delivering Green Buildings	80	369	4.61	0.92	4th
Unwillingness on the part of the craftsmen to acquire in –depth knowledge/ skills in the chosen trade.	80	367	4.58	0.92	4th
Aging of skilled workforce in the industry	80	366	4.58	0.92	4th
Need to upgrade managerial and technical skills	80	358	4.48	0.89	7th
High Cost of Training Construction Craftsmen	80	358	4.48	0.89	7th
Rapid changes in the technologies	80	357	4.46	0.89	7th
Lack of departmental approval	80	355	4.44	0.89	7th
Training institution do not include green construction in their curriculum	80	343	4.29	0.86	11th
Lack of adequate facilities for craftsmen training.	80	333	4.16	0.83	12th

Source: Field Survey 2019

Table 5 indicates nine (9) strategies for bridging the skills gap for delivering green buildings and it also shows the minimum, maximum, the means, standard deviation and the rank (base on mean) for each strategy. It can be observed that the most rated strategies is skills development, both federal and state government should play a dominant role in terms of investments and being facilitators with mean 4.79, while government should formulate policies that would drive more green buildings with mean 4.70 is ranked second. State should lead by example in design and construction of green buildings project with mean score of 4.65; which is the third in ranking. While other strategies were rated according to their mean by ranking. It can be concluded that all the strategies are adjudged by respondents as suitable (having their mean scores above 4.0) for addressing the skills challenges impeding the delivery of green buildings. However, the first three strategies may be deemed to be the most needed strategies for bridging the skills gap for delivering green buildings in Nigeria.

TABLE 5: STRATEGIES FOR BRIDGING THE SKILLS GAP FOR DELIVERING GREEN BUILDINGS.

STRATEGIES	SUM	∑FX	MEAN	RII	RANK
For skills development, both federal and state government should take a dominant role in terms of investments and being facilitators.	80	383	4.79	0.95	1st
Government should formulate policies that would encourage more green buildings.	80	376	4.70	0.94	2nd
State should lead by example in design and construction of green buildings project	80	372	4.65	0.93	3rd
Government should trainers to create new knowledge and improve teaching standards.	80	369	4.61	0.92	4th
Launching of initiatives to improve the quality and availability of instructors in training need areas	80	368	4.60	0.92	4th
State governments and other local bodies should be involved in skill development and employment generation at the local level.	80	366	4.57	0.91	6th
Training incentives should be provided by government and private sectors to encourage enrollment of craftsmen in training.	80	363	4.53	0.91	7th
Adequate apprenticeship system	80	358	4.47	0.89	8th
The industry stakeholders should focus of modular courses and short term training with fast changing skills in the labor market.	80	355	4.3	0.89	9th

Source: Field Survey 2019

IV. Concussion

The primary objective of this research is to investigate the skills gap limiting green building delivery in South Western Nigeria through the gathering and analysis of relevant data that would facilitate the articulation of appropriate strategies for closing the gaps. It has been empirically established that the there is inadequate capacity both in the design and execution of green building projects; and a number of factors responsible for this have been identified and analyzed. The study has also articulated approaches for bridging the gaps of training of green building workmen in order to ensure quantitative and qualitative supply of operatives for green building delivery in the study area. Clearly, there is an urgent need for appropriate actions to be taken so that the situation will not be exacerbated. The approaches advanced in the study, if implemented would reasonably help to bridge the gap in supply and assist to provide adequate operatives for the future need of the green building delivery and thus advance sustainable development agenda in the country, and mitigate the housing and infrastructural problems in Nigeria.

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