QUANTITY SURVEYORS' COMPETENCIES IN THE EMERGING GREEN BUILDING ADOPTION

BABALOLA, A. J. and ONOSOSEN, A. O.
Department of Quantity Surveying, Faculty of Environmental Sciences,
University of Lagos Akoka, Yaba, Lagos

ABSTRACT
In the face of the rising cost of conventional buildings and relentless climate change, green buildings have been touted to ensure efficient resource maximisation and energy usage minimisation. However, there is a literature gap on green competencies for quantity surveyors towards the green building campaign. In this regard, this study aims to measure the relevance of the current and emerging green competencies required of quantity surveyors following the pathway guide of the RICS (Royal Institution of Chartered Surveyors). The study employed the quantitative research method in data gathering. Random sampling and questionnaires were administered to Quantity Surveying firms registered with QSRBN and CACin Lagos State. Descriptive statistics such as the measures of central tendency were used to analyse the data. The study discovered that competencies of utmost concern to enable Quantity surveyors to participate in green building are hard and soft valuation issues, expert advice on sustainable material selection, expert advice on environmental law and policy, sustainable valuation and expert advice on the financial impact of green buildings as imperative in fully giving the quantity surveyor the technical know-how to contribute and participate in green building advisory services. Therefore, Urgent intervention is required for the extensive building of knowledge in these areas for AEC curricula and to develop capacity vital for professionals to participate in sustainable infrastructure delivery.

Keywords: *Competencies, Construction Sector, Emerging Green Building, Disposition, Quantity Surveyors.*

1. INTRODUCTION

Global demand for infrastructure is continually on the rise, but not without concerns about the detrimental impact of buildings on the environment and its effect on climate change. The impact of construction processes on the environment ranges from Carbon emission (Lu, Wu, Chang & Li, 2017) to noise pollution (Lu, Le & Song, 2017), resource consumption (Chang, Soebarto, Zhao & Zillante, 2016) and waste generation (Lu et al., 2017). Emerging discourse on sustainability defined sustainable development as "development which fulfils the needs of the present without compromising the ability of future generations to meet their own needs" (Environmental Protection Agency, EPA, 2016). A vital component of this is the advent of green buildings, which aims at creating structures and processes that are environmentally responsible and resource-efficient from the inception through the whole life cycle of a building (EPA, 2016, Nguyen, Skitmore, Gray, Zhang & Olanipekun, 2017).

Green buildings have been touted as the ultima solution to the hazardous implications of the conventional building system as they offer the prospect of; enhancing the health and comfort of users, toning down on energy consumption, maximise the use of resources and reducing environmental wastes and societal disturbances (Darko & Chab, 2016). Competence has been defined as the requisite knowledge, skillset, behavioural attitude and capability that enhances job performance (Aigbavboa & Thwala, 2019).

Previous studies such as Darko & Chan (2016) have examined barriers to green building adoption and constrained implementation in the Nigerian construction industry, suggesting the Lack of Knowledge/Awareness as a critical component. To further extend knowledge in this area, it becomes imperative to examine the gap in the professional skill set needed to upskill Quantity surveyors for

participation in the green building process. However, Lu et al. (2017) identified interoperability of green building system in BIM, the limited ability of BIM application to support construction and operation phases of green projects, lack of clear industry codes for green building, low industrial acceptance of green BIM applications, low accuracy of BIM-based prediction models and lack of appropriate project delivery methods to leverage green BIM applications as six critical gaps in Green building learning. There is, however, no discussion of the professional competence skills needed to drive the execution of green building concepts on construction sites; an absence of this undermines any progress made in green building/ sustainable development.

A better understanding of barriers to green building adoption, such as inadequate green learning and teaching outcomes, must be addressed to properly formulate strategies to overcome the challenges (Chan, Darko, Ameyaw & Owusu-Manu 2017). Resistance to change was identified by Chan et al. (2016) in a study conducted in the US as a pivotal barrier to the full adoption of green building. It becomes important to gauge the disposition or perception of quantity surveyors in the Nigerian built environment to green building vis a vis filling the gap on the paucity of studies on green competencies (Cabral & Dhar, 2019; Dlimbetova, Zhylbaev, Syrymbetova, &Aliyeva 2016). Ganiyu, Oyewobi, Nwokobia and Sulaiman (2012) maintain that quantity surveying is dynamic. With the disruptive nature of the debate on sustainability and the increasing adoption of green buildings, the quantity surveyor as a major stakeholder in the construction industry must redevelop its competencies to match the knowledge requirement of environmental sustainability and green building. Therefore, the study's objectives are to identify critical competencies needed for quantity surveyors to participate in green building.

2. LITERATURE REVIEW

2.1 Green Building/Sustainability

Sustainability focuses on three critical aspects; Social, Economic and Environmental, focusing more on the environmental and economic impact on the building's life cycle, leading to the adoption of green building systems (Zuo et al. 2016; Chan 2017). Over-exploitation of resources leading to alterations in global climate necessitated the advent of green buildings to deal with the increasing spate of greenhouse gas emission, depleting freshwater systems and natural resources (Olanipekun, Xia & Skitmore, 2016). Therefore, green building promotes the use of systems that maximise resources efficiently from the inception through the whole life cycle of a building (Olanipekun et al., 2016; Chan 2016).

2.2 Quantity Surveyors Competence

The Quantity Surveyor is a built environment professional charged with ensuring the resources of the industry are utilised to the best advantage of society by providing financial management for the project and cost consultancy services to the client and designers during the whole construction process (Dada, 2014; Aigbavboa & Thwala, 2019). Competence training is essential to Quantity surveyors as gaining expertise in green building system development is comparable to other skills relevant to the professional knowledge of the Quantity Surveyors and engaging in transformative green building practices (Cole, 2019). It becomes imperative that the professional quantity surveyor is upskilled within the four dimensions of green building literacy (GBL): knowledge of green building practices, practical skillset, affect and behavioural attitude (Cole, 2019). Jan, Lin, Shiao, Wei, Huang, and Sung (2012) used Roth (1992) study on environmental literacy to build a curriculum framework and evaluation tool for green building literacy. On the contrary, Cole (2019) maintains a lack of theoretical background on STEM education in major features of green building literacy. Shiao, Lin, and Sung (2013) claim that there have been significant increases in knowledge on green building systems, attitudes and behaviours towards them from pre- to post-course. However, Onososen (2019) established a critical dearth of green building literacy in a study

of Tertiary institution curriculums on green building literacy in schools offering Quantity Surveying in the Nigerian AEC sector.

2.3 Green Competencies

Recent studies by Cabral and Dhar (2019) outline green competencies as people's capacity to interact with the environment in a non-detrimental approach geared towards maximum and efficient use of resources. This must also be done with enormous eagerness (Steele, 1980). Invariably, green competence takes the holistic approach of ensuring the professionals is knowledgeable in resource conservation and environmental skills, meticulous of a lifestyle of environmental sustainability and creative in constantly innovating means to reduce the injurious effect of the building on the environment (Cabral & Dhar, 2019). Major features of competency in green building practices would indicate green building and knowledge skills, affective dispositions and green buildings, behaviours and green buildings was addressed by Cole (2019) into factual knowledge to include knowledge of the various components of green building design (recycled content materials), conceptual knowledge focuses on awareness on the intricacies between elements in green building (such as the appropriate siting of windows in cooling the building or the detrimental effect of glass facades for birds crashing into the building). Furthermore, Cole (2019) promotes the idea that skills imperative to the green building also includes; picking eco-friendly construction elements, investigating the performance of the design and properly operating green buildings. Dispositions and behaviours address the disposition of the built professionals to acquire green building literacy knowledge and skills vital to articulately engaging in green building practice.

2.4 Dimensions of green competencies

Green competencies constructs include green knowledge, green skills, green awareness, green attitudes, green abilities and green behaviour.

2.4.1 Green knowledge and green skills

Professional participation in green building development requires green building knowledge. According to Carbal and Dhar (2019), it encompasses general knowledge about the natural environment's processes, concepts, and relationships and the entire ecosystem. Environmental education in developing countries is invaluable to driving green building development (Goh & Balaji, 2016). As established by the Commonwealth Department of Education, Employment and Workplace Relations (DEEWR) (2011), green skills are "the professional and vocational skills, as well as the generic skills (such as sustainable approaches, innovation and problem solving) required for new green jobs and the greening of existing jobs across all industry sectors as a response to climate change and sustainability imperatives". At the firm level, the acquisition of green skills is essential for the engagement and involvement of professionals in ensuring the sustainable operations of the organisation (Wu, Thongma, Leelapattana& Huang 2016).

2.4.2 Green abilities and green awareness

Rajiani, Musa and Hardjono (2016) claims that the green abilities are achieved through the human resource management innovation in the firm in ensuring professionals have an easy learning process on the constructs of green education to improve job performance. They also support professionals in the built industry to enhance their performance and achieve conservation (Carbal & Dhar, 2019; Bürgener & Barth, 2018). Therefore, green awareness and engagement go beyond professional competence at the firm and individual levels into a state of contributing to the greater good of society. Green awareness is important to the community as it is vital to the professional. IT enables local communities to engage in approaches to ensure biodiversity conversation (Cabral & Dhar, 2019). Furthermore, He and Liu (2018) contends it establishes the consequences of air pollution in the community, enlighten on cost and risk associated with persistently pursuing conventional building methods, knowledge of energy consumption

and carbon footprint (Garcia, Cordeiro, Naas&Costa Neto 2019; Shrouf, Gong & Ordieres-Mere, 2017; Peng & Liu, 2016).

2.4.3 Green attitude and green behaviour

Studying the disposition or response of professionals to green building development is imperative to gauge the attitude towards adopting the emerging concept. Cabral and Dhar (2019) opine that green attitude refers to the feelings comprising of evaluative action to participate in environmental sustainability. The strongest the positive attitude towards the concept, the easier it is to introduce learning constructs and implementation to professionals (Ojo 2019, Casalo & Escario 2018). However, Wang (2016) contends that green behaviour encourages environmentally sustainable behaviour. This implies actions and works by individuals channelled towards ensuring sustainable environmental, economic, and social decisions. Green behaviour also denotes the usage of green products or participation in green building by professionals through using green products, reusable and recyclable products (Paco, Shiel & Alves, 2019; Cheng, Hu & Zhou, 2019).

3. RESEARCH METHOD

The study used a structured Questionnaire design in a quantitative research approach. Consequently, competency research in construction has relied on survey questionnaires to collect data from participants (Cabral & Dhar, 2019, Olanipekun et al., 2016). Hence, this study engaged a quantitative research method using a survey questionnaire.

A structured questionnaire was used, which was designed to test the green competencies of quantity surveyors and their disposition to green building development. The elements of the population of quantity surveying firms in Nigeria though not statistically infinite, cannot be fully accessed. The randomness characteristics embedded in probability sampling (Cooper &Schindler, 2006) require that all firms be given equal opportunity to be part of the survey. A simple random sampling was done to administer the research instrument.

Experts confirmed the validity of the questionnaire in built environment education, and the reliability test carried out through internal consistency test revealed the constructs were very good (Cronbach alpha value of 0.914). The study's direction was focused on examining competencies based on the perspective of most experienced quantity surveyors in Qs firms to guarantee quality responses based on expertise and years of experience. Therefore, the sample was obtained from a population of 56 quantity surveying firms in Lagos registered with the Nigeria Institute of Quantity Surveying (NIQS) and the Corporate Affairs Commission (CAC). The questionnaire was distributed via email, hand delivery and using an online survey (Google forms) with regards to the convenience of the participants.

A total of 30 fully answered and valid responses were received, representing 83% of the population; the data collected were analysed using SPSS version 20.0. The constructs were analysed using descriptive statistics such as measures of central tendency. Secondly, Cronbach alpha values were calculated to ensure the internal consistency of each performance measure.

4 Data Analysis

4.1 Mandatory Competencies

These competencies are personal, interpersonal, professional practice and business skills required of a quantity surveyor (RICS, 2018). The participants were asked to indicate how relevant the skills are to green building/sustainable development. It was ascertained that Establishing clients' objectives, health and safety competencies and inclusive environments are highly relevant to quantity surveyors participating in sustainable developments. In contrast, other competencies in the mandatory competencies bracket were deemed of moderate relevance.

Table 1: Mandatory Competencies for Quantity Surveyors

Mandatory Competencies	Mean	Rating
Inclusive environments; health and safety requirements, drafting of clauses on use of space	4.89	High Relevance
Health and safety; reviewing health and safety proposals as part of a contractor's tender,	4.76	High Relevance
Establishing clients' objectives	4.69	High Relevance
Data management; using a computerised central project database	3.82	Moderate Relevance
Diversity, inclusion and team working; supply chain management	3.75	Moderate Relevance
Effective documentation	3.72	Moderate Relevance
Conflict avoidance, management and dispute resolution procedures	3.70	Moderate Relevance
Accounting principles and procedures: role of the auditor	3.55	Moderate Relevance
Ethics, Rules of Conduct and professionalism	3.53	Moderate Relevance

4.2 Core Competencies for Quantity Surveyors

Core competencies are the primary competencies required for a Quantity Surveyor to practice professionally (RICS, 2018). The participants identified design economics, Quantification and costing, commercial management, and construction technology as highly relevant to participation in green building/ sustainable development. In contrast, other core competencies have moderate relevance.

Table 2: Core Competencies for Quantity Surveyors

Core Competencies	Mean	Rating
Design economics and cost planning; carrying out life-cycle costing, producing the order of cost estimates	4.93	High Relevance
Quantification and costing (of construction works; measurement, bill of quantities preparation).	4.87	High Relevance
Commercial management (of construction works) preparing cash flows, application of value engineering	4.83	High Relevance
Construction technology and environmental services	4.61	High Relevance
Project finance (control and reporting); using risk management techniques	3.75	Moderate Relevance
Selecting the form of contract for the chosen procurement route, advising on the appropriate contractual method	3.68	Moderate Relevance
Compiling tender documents, implementing procurement routes, preparing and evaluating tender reports.	3.59	Moderate Relevance

4.3 Optional Competencies for Quantity Surveyors

Optional competencies are additional skill requirements from a list of competencies relevant to the area of practice (RICS, 2018). Sustainability was identified as highly relevant, while other optional competencies such as Capital allowances, project feasibility analysis, risk management, insurance, programing and planning and advertising as an expert witness were identified as a moderate relevance.

Table 3: Optional Competencies for Quantity Surveyors

Optional Competencies	Mean	Rating
Sustainability; renewable energy options, determining the impact of sustainability issues on design and construction, carrying out a life-cycle cost	4.76	High Relevance
Capital allowances; presenting reports and documentation, advice on issues affecting acquisitions, disposals and developments.	3.84	Moderate Relevance
Project feasibility analysis; advising on the impact of cost, carrying out an appraisal	3.72	Moderate Relevance
Risk management	3.70	Moderate Relevance
Insurance; compiling cost data for an insurance claim	3.65	Moderate Relevance
Programming and planning;	3.61	Moderate Relevance
Due diligence; reviewing final accounts, checking compliance with loan agreements, reviewing interim valuations	3.58	Moderate Relevance
Advising as an expert witness, resolving disputes as a mediator	3.52	Moderate Relevance

4.4 DISCUSSION OF FINDINGS

RICS (2018) classified competencies required of quantity surveyors into Mandatory, Core and optional competencies. Critical skills under these competencies vital to green building learning as identified from the survey are; Health and Safety learning, establishing client objective and inclusive environment as mandatory competencies. Core Competencies highly relevant are; design economics and cost planning, quantification and costing, commercial management and construction technology. Optional competencies which indicate additional skills requirement highly relevant are sustainability skills, including life-cycle costs, renewable energy options and determining the impact of sustainability issues on design and construction. The participants wholly agreed on the high relevance of skills such as; hard and soft valuation issues, expert advice on sustainable material selection, expert advice on environmental law and policy, sustainable valuation and expert advice on the financial impact of green buildings as imperative in fully giving the quantity surveyor the technical know-how to contribute and participate in green building advisory services. The knowledge of these skills would aid quantity surveyors in addressing the gaps in their skills and areas in need of upskilling to become certified green building experts. Green competencies are invaluable in promoting green building to enable quantity surveyors to offer expert green advice (Goh & Balaji, 2016).

Green training is imperative to green awareness, as awareness is fostered through green training as training aids employees' consciousness on perception and attitude towards sustainable development (Mishra, 2017).

5. CONCLUSION AND RECOMMENDATION

The results of the study proved that though quantity surveyors have the mandatory and core competencies to function as quantity surveyors, they cannot engage or participate in the sustainable building except upskilling in the emerging green competencies by acquiring skills in areas such as; hard and soft valuation issues, expert advice on sustainable material selection, expert advice on environmental law and policy, sustainable valuation and expert advice on the financial impact of green buildings as imperative in fully giving the quantity surveyor the technical know-how to contribute and participate in green building advisory services. This proves that green competencies training is essential to drive a holistic adoption of green building, which could be achieved through in-house firm-level training, professionals' bodies' seminars and conferences and certification courses by regulatory bodies and educational institutions with the required green curriculum.

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