

Factors Influencing Quantity Surveyors' Involvement in the Delivery of Sustainable Housing Projects in Nigeria

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ABSTRACT

As demand for sustainable development grows globally, role of Quantity Surveyors in integrating sustainability into construction processes has become vital. This study therefore investigates the Factors Influencing Quantity Surveyors' Involvement in the Delivery of Sustainable Housing Projects in Nigeria. The study comprises a sample of 48 Quantity Surveyors who had participated in sustainable housing projects. They were selected using the Respondent Driven Sampling technique. Data gotten from the questionnaires were analyzed using amongst others, mean score test, analysis of variance and factor analysis.

The study reveals that Quantity Surveyors' involvement in sustainable housing projects in Lagos is driven by a complex interplay of factors. Continuous professional development, technological advancements, and market demands emerge here as key drivers. Quantity surveyors are willing participants in this new era of technological advancement, this finding cements the importance of ongoing learning and skill enhancement in adapting to the evolving demands of sustainable construction.

The originality lies in its exploration of the factors influencing the involvement of Quantity Surveyors in the delivery of sustainable housing projects, offering novel perspectives on how these factors can pave the way for transformative improvements in construction sector. The study provides empirical insights into factors that can aid Quantity Surveyors involvement in the delivery of sustainable housing projects in the construction industry and beyond.

Keywords: Delivery, Construction, Economic, Environment, Factors, Housing, Involvement, Key Drivers, Projects, Quantity Surveyors, Social, Sustainability

INTRODUCTION

To sustain something means to keep it in the current state and today's current state is a big no for the constant use and dump of conventional materials. Environmental issues in the construction industry are increasingly being considered, as clients and design teams become more conscious of the impacts (Ball, 2002). This focus on sustainability has consequently led to a global shift towards buildings that are sustainable (Berardi, 2011). In Nigeria, as in several developing countries, the concept of sustainability is unknowingly being practiced all over the country by using an alternative to conventional building materials. (Ahmed *et al.*, 2022). Sustainable buildings can be defined as the development and implementation of policies, programmes or initiatives designed to deliver safe, viable and affordable houses/buildings for individuals within a society. According to Leo-Olagbaye (2024) opined that Sustainable buildings are automated buildings with their controller and automation systems.

With a rapidly soaring population of 170 million inhabitants, Nigeria is urgently in need of sustainable solutions to the many socioeconomic challenges confronting her development. This phenomenal rise in population, spontaneous increase in the number and size of most Nigerian cities have in the past few decades led to acute shortage of decent and affordable dwelling units (Adesoji, 2011).

Research undertaken by Petrovic.,(2019) however showed that Quantity Surveyors place little importance on environmental sustainability issues in delivering their traditional services. This seems controversial, though, given that there has been a tendency in recent years to broaden the acceptance of sustainability, and certain terms and elements pertaining to sustainability are used by Quantity Surveyors, regardless of whether they are in training or not. Professional Quantity Surveyors have developed skills in keys areas relating to technology, information management, culture and economic aspects that can be expertly applied on projects at appropriate levels through training and practice (Chau *et al.*, 2015). Their success will depend on their ability to adapt to changes and continuous development of their skills and competencies to contribute to meeting client's objectives (Chong *et al.*, 2012).

LITERATURE REVIEW

Sustainability

Sustainability has emerged as a critical concept in addressing the complex challenges posed by environmental degradation, social inequality, and economic instability. The construction sector has a crucial role in the realization of sustainable development. However, stakeholders involved in construction projects often lack a clear understanding of their roles and responsibilities. (Leo-Olagbaye *et al.*, 2015). One thing is certain and that the world as we know it know today is veering away from the use of conventionally materials to favor sustainable ones. Sustainable housing execution entails cooperation from the public, government and construction practitioners. Perception of sustainable housing by professionals and practitioners in the building industry and the public varies within and without the two groups. (Leo-Olagbaye and Odeyinka., 2022). The key driving force behind this quest for sustainability has largely been emissions, which are forecasted to keep rising at par with industrial levels as energy demands by the buildings increase (Petrovic, 2019). These emissions in turn causes a great deal for us in our ozone layer, which in turn affects the climate. Which is why, in turn sustainability has seen a major positive upturn in application particularly when discussions are being made in relation to construction work. The ability of buildings to reduce these projected levels of emission to the minimal makes it credible for more attention to the building sector (IPCC, 2007). This leads to the need for sustainability rating methods to rank buildings in terms of their sustainability or greenness (Arif *et al.*, 2009).

Factors Influencing the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects

The involvement of Quantity Surveyors in sustainable housing projects is crucial as they play a vital role in ensuring the financial and environmental viability of these projects. Several factors positively influence the involvement of Quantity Surveyor's in sustainable housing initiatives, which can be broadly categorized into five key areas: policy and regulatory drivers, economic considerations, technological advancements, stakeholder engagement, and professional development.

One of the primary factors driving the involvement of Quantity Surveyors in sustainable housing is the evolving policy and regulatory landscape. Governments around the world have implemented various policies and regulations to promote sustainable construction practices, such as building energy efficiency standards, carbon emission reduction targets, and sustainable procurement requirements (European Commission, 2021). These policies create a strong impetus for Quantity Surveyors to integrate sustainable design and construction principles into their work, as they need to ensure compliance with these regulatory frameworks (Olawunmi and Chan, 2018).

From an economic perspective, the growing emphasis on life cycle costing and whole-life value has significantly influenced the role of Quantity Surveyors in sustainable housing projects. Quantity Surveyors are uniquely positioned to conduct comprehensive life cycle cost analyses, incorporating energy efficiency, maintenance, and end-of-life considerations, to demonstrate the economic viability of sustainable housing solutions (Goh and Sun, 2016).

The rapid advancements in building information modeling (BIM) and other digital technologies have also positively impacted the involvement of Quantity Surveyors in sustainable housing projects. BIM-enabled data

integration and visualization allow Quantity Surveyors to effectively analyze the environmental and financial implications of design decisions, enabling them to optimize sustainable design solutions (Tay, (2015). Additionally, the use of digital tools, such as energy modeling and carbon footprint calculators, empowers Quantity Surveyors to provide more accurate and data-driven assessments of the sustainability performance of buildings (Ngyen *et al*, 2010). Effective stakeholder engagement and collaboration are crucial factors in the successful integration of Quantity Surveyors into sustainable housing initiatives. Quantity Surveyors must work closely with architects, engineers, contractors, and sustainability consultants to align their cost management expertise with the overall sustainability objectives of the project (Alwan *et al*, 2017). This collaborative approach helps to identify and address potential trade-offs between cost and sustainability, leading to more holistic and sustainable decision-making (Zabihi *et al*, 2013).

The professional development and continuous learning of Quantity Surveyors also play a significant role in their involvement in sustainable housing projects. As the field of sustainable construction evolves rapidly, Quantity Surveyors need to stay abreast of the latest trends, technologies, and best practices (Emuze and Smallwood, 2014). By actively engaging in professional development activities, such as attending training sessions, participating in industry events, and joining sustainability-focused communities of practice, Quantity Surveyors can enhance their knowledge and skills to effectively contribute to the delivery of sustainable housing (Häkkinen and Belloni, 2011). The growing awareness and client demand for sustainable housing solutions have also positively influenced the involvement of Quantity Surveyors. As homebuyers and tenants become more conscious of the environmental and health benefits of sustainable housing, they are increasingly prioritizing these considerations in their purchasing decisions (Banani *et al*, 2016). This shift in market demand has incentivized the construction industry, including Quantity Surveyors, to integrate sustainable practices more proactively into their projects (Babangida, 2012).

The emergence of innovative financing mechanisms, such as green bonds and sustainability-linked loans, has provided additional support for the involvement of Quantity Surveyors in sustainable housing projects. These financial instruments incentivize the development of environmentally responsible and socially conscious projects, which aligns with the expertise and responsibilities of Quantity Surveyors (Hyun and Jang, 2020).

The findings from this research work will investigate the positive factors influencing Quantity surveyors' involvement in sustainable housing projects within the Lagos, Nigeria housing development landscape, while examining their evolving roles and responsibilities throughout the construction stage.

Table I: Summary of Factors That Influence The Involvement of Quantity Surveyors in the Delivery Sustainable Housing Projects

S/N	Factors	Sources
1	Evolving policy and regulatory drivers	(Olawunmi and Chan, 2018)
2	Growing emphasis on life cycle costing and whole-life value assessment.	(Goh and Sun, 2016).
3	Advancements in building information modeling (BIM) and other digital technologies	(Bynum <i>et al</i> , 2013).
4	Effective stakeholder engagement and collaboration among Quantity Surveyors and other professionals in the construction industry	(Zabihi <i>et al</i> , 2013).
5	Continuous professional development	(Emuze and Smallwood, 2014)
6	Increasing client demand and market awareness for sustainable housing solutions.	(Banani <i>et al</i> , 2016)
7	Emergence of innovative financing mechanisms, such as green bonds and sustainability-linked loans, that incentivize sustainable construction.	(Hyun and Jang, 2020)
8	Alignment of sustainable construction practices with the core competencies and responsibilities of Quantity Surveyors.	(Barua and Gyakum, 2019)
9	Advancements in construction materials and technologies that improve the environmental performance of buildings.	(Zalejska-Jonsson, 2014)
10	Growing focus on water conservation and the implementation of sustainable water management strategies.	(Haigh and Dilanthi, 2020)

11	Incorporation of passive design features, such as natural ventilation and daylighting, to reduce energy consumption.	(Haigh and Dilanthi, 2020)
12	Improved understanding of the long-term financial benefits of sustainable design and construction.	(Caplehorn, 2012)
13	Increasing availability of green building certification and rating systems that drive sustainable design and construction.	(Peah, 2009)
14	Increasing availability of professional training and education programs focused on sustainable construction.	(Robichaud & Anantatmula, 2011)
15	Supportive policies and incentives from governments and regulatory bodies to promote the adoption of sustainable construction practices.	(Pittau <i>et al</i> , 2019)

METHODOLOGY

This study seeks to comprehensively explore the involvement of Quantity Surveyors in delivering housing projects within Lagos, Nigeria. To achieve a well-rounded understanding, the research targeted a less diverse range of participants across the construction ecosystem in Lagos.

Firstly, the study engaged registered Quantity Surveyors who were actively involved in sustainability construction projects within Lagos. Their insights were crucial to this study as they play a central role in cost analysis, procurement, and value engineering – all vital aspects of achieving sustainable construction.

Through that approach of encompassing Quantity Surveyors who were involved in sustainability housing projects, the study provided a holistic view of the roles Quantity Surveyors play in promoting sustainable construction within the dynamic and evolving context of Lagos, and beyond even as far as West Africa. This comprehensive approach ensured the study captured the key factors impacting sustainable building delivery and identified opportunities for Quantity Surveyors to become even more instrumental in shaping a more sustainable future for Lagos.

Sample Frame and Sample Size

A sampling frame includes a numerical identifier for each target population to aid in analysis and allow for division into further frames for more in-depth analysis. Sample size is defined as the number of elements that can be selected for research. The sample size of this study covered Quantity Surveyors that has been involved in sustainable housing projects in Lagos State, Nigeria.

Sampling Procedure

Respondent-Driven Sampling (RDS) is a network-based sampling method designed to study hard-to-reach populations. It combines snowball sampling with a mathematical model that weights the sample to compensate for the non-random recruitment process. This study employed RDS as the sampling procedure to investigate Quantity Surveyors' involvement in the delivery of sustainable housing projects in Lagos, Nigeria.

The choice of RDS for this research is based on its ability to access interconnected professional networks effectively. In the context of Quantity Surveyors working on sustainable housing projects in Lagos, this method offers several advantages. Implementation of RDS began, with the identification of initial participants, known as seeds, who were active in sustainable housing projects in Lagos. These seeds then recruited their peers, creating waves of recruitment that extended through the professional network. This approach produced a yield of diverse sample of Quantity Surveyors with varying levels of involvement in sustainable housing projects.

By utilizing RDS, this study overcame potential challenges in accessing the target population and to generate a more comprehensive understanding of quantity surveyors' roles in sustainable housing initiatives. While implementing RDS, careful attention was paid to managing potential biases and ensuring the validity of the data

collected. The insights gained through this sampling method are anticipated to contribute significantly to the understanding of Quantity Surveyors' involvement in sustainable housing projects in Lagos, Nigeria.

Method for Data Collection

Data for the study were collected through primary (Questionnaires) source, in order to provide more insight into Quantity Surveying involvement in the delivery of sustainable housing projects in Lagos, Nigeria. In order to achieve the overall objectives, The questionnaire was well-structured and designed as a close-ended type to facilitate anonymity, freedom of expression, and confidentiality (Patten, 2016). The questionnaire comprised two sections, A and B. Section A comprised the demographic data for the respondents and organizations. While Section B concentrated on factors that influence the involvement of Quantity Surveyors in sustainable housing projects.

Method of Data Analysis

In achieving the overall objective, mean score analysis, ANOVA and Factor Analysis were used to ultimately analyze the resulting factors collated from section B of the questionnaire report. Section A was classified and analyzed as a base comparison to generate important data used to support the resulting findings.

Mean Score Analysis

The mean ranking analysis was adopted for this study to achieve the overall objectives, a 6-point Likert-type scale was employed for data collection across section B – section D, the formula for mean score analysis is given as;

$$MS = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1 + 0n_0}{n_5 + n_4 + n_3 + n_2 + n_1 + n_0}$$

Where;

n_0 = no of respondent who answered “no level of involvement” or “not important”

n_1 = no of respondent who answered “very low level of involvement” or “very low-level importance”

n_2 = no of respondent who answered “low level of involvement” or “low level of importance”

n_3 = no of respondent who answered “moderate level of involvement” or “moderate level importance”

n_4 = no of respondent who answered “high level of involvement” or “high level of importance”

n_5 = no of respondent who answered “very high involvement” or “very high level of importance”

ANOVA

ANOVA entails a statistical method comparing means across multiple groups to determine significant differences. It partitions variance into within-group and between-group components, assessing factors' impact on a dependent variable.

Factor Analysis

Factor Analysis uses a statistical technique that identifies underlying factors explaining correlations among observed variables. It reduces numerous variables into fewer factors and reveals hidden data structures. In this study, Factor Analysis was adopted to explore potential linear relationships between a reduced number of unobservable factors and the variables of interest (Johnson & Wichern, 2022).

DATA ANALYSIS AND DISCUSSION OF FINDINGS

The sample size indicated in this study involved mainly Quantity Surveyors that have been involved with Delivering Sustainable housing projects in Lagos, Nigeria. Using the Respondent Driven Survey technique as sampling technique to collect data, a total of 48 questionnaires were distributed without a benchmark, and 48 responses were returned as seen on Table II. This represented a response rate of 100%. This is considered suitable as response rates that ranges between 30% - 60% are considered good. (Valdes-Vasquez and Klotz (2012).

Table II: Questionnaire Administered and Received

Questionnaires Administered	Questionnaires Received	Percentage
48	48	100%

Background of the Respondent

The survey data here provides insights into the professional experience, academic qualifications, project involvement, and firm types of 48 respondents in the field of housing construction, with a focus on sustainable housing projects. Table III, presents a summary on the professional background of the 48 respondents involved in sustainable housing projects. In terms of professional experience, the largest group of respondents (41.7%) have been in the field for 6-10 years, closely followed by those with 5 years or less experience (37.5%). A smaller proportion have more extensive experience, with 16.7% having 11-15 years, and 4.2% having over 16 years in the profession.

Regarding academic qualifications, the respondents are well educated, with some respondents at least holding two or more degrees. Each respondent were made to select the highest form of degree obtained with 66.7% holding a B.Sc. or B.Tech. Degree. A significant portion (20.8%) have advanced to obtain M.Sc. or M.Tech. degrees, while 12.5% hold HND qualifications. Notably, there are no Ph.D. holders among the respondents.

The respondents have varying levels of involvement in housing projects. The largest group (45.8%) has participated in 6-10 projects, while 22.9% have worked on 0-5 projects. Some respondents have more extensive project experience, with 18.8% having been involved in more than 15 projects. The respondents also come from diverse professional settings. The largest group (41.7%) works in firms that handle both consulting and contracting, while 35.4% are in contracting firms, and 22.9% are in consulting firms.

Table III: Respondent Background Information

Background Information	Parameters	Frequency	Percent	Cum. Percent	Mean
Years of professional experience	5 years or below	18	37.5	37.5	
	6 - 10 Years	20	41.7	79.2	7.44
	11- 15 Years	8	16.7	95.9	
	16 - 20 Years	1	2.1	98.9	
	Above 21 Years	1	2.1	100	
	Total	48	100		
Highest academic qualification(s) of respondent	HND	6	12.5	12.5	
	B.Sc./B.Tech	32	66.7	68.7	
	M.Sc/M.Tech	10	20.8	81.2	
	PHD	0	0.0	100	
	Total	48	100		
Number of housing projects you have participated in	0 – 5	11	22.9	22.9	
	6 – 10	22	45.8	68.7	9.35
	11 – 15	6	12.5	81.2	
	15 above	9	18.8	100	

	Total	48	100		
Type of Firm	Consulting	11	22.9	22.9	
	Contracting	17	35.4	58.3	
	Both (Consulting and Contracting)	20	41.7	100	
	Total	48	100		
Number of sustainable housing projects you have participated in	0 – 5	30	62.5	62.5	5.5
	6 – 10	13	27.1	89.6	
	11 – 15	4	8.3	97.9	
	Above 15	1	2.1	100	
	Total	48	100.0		

When it comes to sustainable housing projects specifically, the majority of respondents (62.5%) have limited experience, having participated in only 0-5 such projects. A smaller group (27.1%) has been involved in 6-10 sustainable housing projects, with very few having experience beyond that.

This data paints a picture of a workforce with a mix of early-career and mid-career professionals, well-educated, and gaining experience across various types of housing projects. However, there appears to be a gap in experience specifically related to sustainable housing projects, suggesting a potential area for growth and development in the industry.

Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects

The Cronbach's alpha figures indicated in table IV are set at 0.914, which suggest that the responses provided are excellent, and are expected to be reliable in carrying out this study.

Table IV: Reliability Statistics for Data ON Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects

CRONBACH'S ALPHA	NO OF ITEMS
.914	15

The data on table V presented previews a comprehensive overview of the factors promoting the involvement of quantity surveyors in the delivery of sustainable housing projects in Lagos, Nigeria.

Table V: Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects Based on the Number of Sustainable Houses they have completed

Factors Promoting the Involvement	Overall			0 - 5			6 - 10			11 - 15			F-Stat	P-Values
	MS	SD	Rank	MS	SD	Rank	MS	SD	Rank	MS	SD	Rank		
Continuous professional development	4.04	0.87	1	3.90	0.80	2	4.31	0.86	1	4.20	1.30	2	1.082	0.348
Advancement in construction materials and technologies	3.94	0.76	2	3.97	0.77	1	3.92	0.64	2	3.80	1.10	3	0.103	0.902
Increase in client demand and Market awareness	3.75	0.76	3	3.73	0.64	4	3.62	0.96	4	4.20	0.84	1	1.098	0.342
Financial benefit of	3.71	0.90	4	3.77	0.90	3	3.62	0.87	3	3.60	1.14	5	0.163	0.850

sustainable construction															
Alignment of sustainable construction practices	3.52	1.01	5	3.60	0.93	5	3.31	1.18	6	3.60	1.14	5	0.386	0.682	
Growing emphasis on Life Cycle Cost Analysis	3.42	0.79	6	3.50	0.82	6	3.15	0.80	8	3.60	0.55	4	1.010	0.372	
Evolving policy and regulatory drivers	3.38	1.04	7	3.33	0.99	8	3.46	1.13	5	3.40	1.34	9	0.067	0.935	
Incorporation of passive design features.	3.29	1.18	8	3.27	1.20	10	3.31	1.32	7	3.40	0.89	7	0.028	0.973	
Factors Promoting the Involvement cont'd	Overall			0 – 5			6 – 10			11 – 15			F-Stat	P-Values	
	MS	SD	Rank	MS	SD	Rank	MS	SD	Rank	MS	SD	Rank			
Developing cost efficient strategies for the maintenance and operation of the building	3.29	1.24	9	3.37	1.33	7	3.15	1.21	9	3.20	0.84	10	0.144	0.866	
Advancements in Building Information Modelling (BIM)	2.98	1.08	10	2.90	1.19	12	3.08	0.95	10	3.20	0.84	10	0.230	0.796	
Financing mechanisms such as loans or bonds	2.94	1.14	11	3.30	1.15	9	2.23	0.83	13	2.60	0.89	13	4.971	*0.011	
Rising stakeholder collaboration	2.90	1.13	12	3.00	1.17	11	2.46	0.97	11	3.40	1.14	8	1.614	0.210	
Increasing availability of green building certification and rating systems	2.63	1.28	13	2.70	1.34	13	2.31	1.11	12	3.00	1.41	12	0.654	0.525	
Growing focus on water conservation	2.50	1.29	14	2.67	1.49	14	2.08	0.76	14	2.60	0.89	13	0.966	0.388	
Policies and incentives from government	2.33	1.62	15	2.60	1.61	15	1.69	1.60	15	2.40	1.52	15	1.465	0.242	

p-value is significant at 0.05

MS = Means Score and SD = Standard deviation

This data provides valuable insights into the drivers shaping the profession's engagement with sustainable development principles in the housing sector.

Continuous professional development emerges as the most significant factor promoting quantity surveyors' involvement in sustainable housing projects, with the highest overall mean score of 4.04. This underscores the importance of ongoing learning and skill enhancement in adapting to the evolving demands of sustainable construction. The high ranking across all project volume categories suggests that quantity surveyors recognize the need for continuous upskilling to remain relevant and effective in this field. Emuze and Smallwood (2014) statement also support this notion as it is explicitly stated in the literature review.

Closely following is the advancement in construction materials and technologies, ranking second with an overall mean score of 3.94. This high ranking reflects the impact of technological progress on the construction industry and highlights the need for quantity surveyors to stay abreast of these developments. The consistency of this factor's importance across different project volumes (p-value of 0.902) suggests that it is a pervasive influence, affecting quantity surveyors at all levels of experience in sustainable housing project.

The third-ranked factor, increase in client demand and market awareness (overall mean score of 3.75), points to the growing recognition of sustainable housing's importance among clients and the broader market. This external pressure appears to be a significant driver for quantity surveyors' involvement in sustainable projects. The relatively high ranking of this factor across all project volume categories indicates that market forces play a substantial role in shaping the profession's engagement with sustainability

Financial benefits of sustainable construction rank fourth overall, with a mean score of 3.71. This highlights the economic incentives driving the adoption of sustainable practices in housing projects. The high ranking of this factor suggests that quantity surveyors are well positioned to demonstrate and leverage the financial advantages of sustainable construction, aligning with their traditional role as cost experts. A mix of roles such as LCCA, incorporating energy efficiency designs and so on helps in achieving a positive financial benefits of sustainable housing projects (Goh and Sun., 2016).

Moving down the list, we see factors such as the alignment of sustainable construction practices, growing emphasis on Life Cycle Cost Analysis, and evolving policy and regulatory drivers. These factors, while still important, show slightly lower levels of influence on quantity surveyors' involvement in sustainable housing projects. Their middling rankings might indicate areas where the profession could potentially increase its focus and expertise to drive greater involvement in sustainable projects.

Interestingly, the incorporation of passive design features and developing cost-efficient strategies for maintenance and operation rank in the middle of the list. This positioning suggests that while these factors do promote involvement, they may not be as influential as some of the higher-ranked factors. This could present an opportunity for quantity surveyors to expand their role in these areas, particularly given their relevance to long-term sustainability and cost-efficiency.

The lower end of the ranking includes factors such as advancements in Building Information Modelling (BIM), financing mechanisms, rising stakeholder collaboration, and increasing availability of green building certification systems. The relatively low ranking of BIM (overall mean score of 2.98) is particularly noteworthy, given its growing importance in the construction industry globally. This could indicate an area for potential growth and increased adoption among quantity surveyors working on sustainable housing projects in Lagos. Tay, W. D. (2015) theorized that the rapid advancement with the use of BIM as positively affected the involvement of Quantity Surveyors with sustainable practices. Therefore, it seems we have a lot of catching up to do regarding this

One factor that stands out in the analysis is financing mechanisms such as loans or bonds. This is the only factor showing a statistically significant variation across project volumes (p-value of 0.011). The mean scores for this factor decrease from 3.3 for those involved in 0-5 projects to 2.23 for 6-10 projects, then increase slightly to 2.6 for 11-15 projects. This U-shaped pattern is intriguing and could suggest a complex relationship between experience and the perceived importance of financing mechanisms.

The lowest-ranked factors include growing focus on water conservation and policies and incentives from government. While these factors still have mean scores above the midpoint of the scale, their lower ranking suggests that they currently have less influence on quantity surveyors' involvement in sustainable housing projects compared to other factors.

In order to gain further insights into the data collected, this study employed factor analysis to identify the factor grouping of the Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects. In other studies where Factor Analysis was applied, 0.5 was used as cutoff points. This study therefore used 0.54, which is considered good as it has 25% overlapping variance. It must also be noted that values less than 0.54 will be suppressed. The Extraction Method used is Principal Component Analysis. The Rotation Method adopted is Varimax with Kaiser Normalization. Rotation converging in 24 iterations.

The need to ascertain the extent of adequacy of the data loaded for the study informed the use of Kaiser-Meyer-Olkin (KMO) and Bartlett's test. The Bartlett's measure tests the null hypothesis that the original correlation matrix is an identity matrix. For factor analysis to be adequate, Kaiser recommends accepting values greater than 0.5 as acceptable. As shown in Table VI, the KMO is 0.79, which falls into the range of being great: so, it is evident that factor analysis is appropriate for this data set. In addition, Bartlett's test of sphericity is highly significant ($p = 0.000$) and therefore it could be established that factor analysis is appropriate.

Table VI: KMO and Bartlett's Test for Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.79
Bartlett's Test of Sphericity	Approx. Chi-Square	424.43
	Df	105
	Sig.	0.000

The total variance explained as presented in Table VII shows how the variance is divided among the 16 possible factors influencing the usage of BIM variables. It must be noted that three factors have eigenvalues (a measure of explained variance) greater than 1.0, which is a common criterion for a factor to be useful. Together, these three factors accounted for about 65.518% of the variability in the original variables, thus suggested that three latent factors were associated with the perception of the years of experience on sustainable building construction against factors promoting the involvement of Quantity Surveyors in the delivery of sustainable housing projects, but there was a room for a lot of unexplained variation.

Table VII: Total Variance Explained for Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.02	46.798	46.798	7.02	46.798	46.798	3.37	22.509	22.509
2	1.658	11.056	57.855	1.66	11.056	57.855	3.37	22.475	44.984
3	1.150	7.664	65.518	1.15	7.664	65.518	3.08	20.534	65.518
4	0.900	5.997	71.515						
5	0.872	5.811	77.326						
6	0.68	4.533	81.859						
7	0.621	4.138	85.997						
8	0.438	2.917	88.914						
9	0.378	2.518	91.432						
10	0.368	2.456	93.888						
11	0.312	2.083	95.971						
12	0.232	1.550	97.521						
13	0.170	1.132	98.652						

14	0.115	0.769	99.421					
15	0.087	0.579	100.00					

Extraction method: Principal Component Analysis

It can be observed from Table VIII that four (4) of the factors promoting the involvement of Quantity Surveyors in the delivery of sustainable housing projects variables loaded on *factor 1* and the first component, which we might call "Policy and Collaborative Drivers," encompasses government policies, stakeholder collaboration, financing mechanisms, and water conservation efforts. This grouping suggests that external policy frameworks and collaborative initiatives play a crucial role in encouraging quantity surveyors to engage with sustainable housing projects.

The second component, "Technological and Analytical Advancements," includes evolving regulatory drivers, BIM advancements, green building certifications, life cycle cost analysis, and passive design features. This component highlights the importance of modern, data-driven approaches and technological innovations in shaping quantity surveyors' involvement in sustainable construction.

The third component, "Market and Professional Development," comprises client demand, continuous professional development, alignment of sustainable practices, and advancements in materials and technologies. This grouping emphasizes the significance of market forces and professional growth in driving quantity surveyors' engagement with sustainable housing projects.

However, two factors- cost-efficient maintenance strategies and financial benefits of sustainable construction - do not show significant loadings on any component, suggesting they might be more complex or multifaceted in their influence.

Table VIII: Rotated Component Matrix for Factors Promoting the Involvement of Quantity Surveyors in the Delivery of Sustainable Housing Projects

	Component		
	1	2	3
Policy and Collaborative Drivers			
Policies and incentives from government	0.841		
Rising stakeholder collaboration	0.791		
Financing mechanisms such as loans or bonds	0.747		
Growing focus on water conservation	0.564		
Technological and Analytical Advancements			
Evolving policy and regulatory drivers		0.791	
Advancements in Building Information Modelling (BIM)		0.696	
Increasing availability of green building certification and rating systems		0.668	
Growing emphasis on Life Cycle Cost Analysis		0.631	
Incorporation of passive design features. E.g, Natural ventilation		0.600	
Developing cost efficient strategies for the maintenance and operation of the building			
Market and Professional Development			
Increase in client demand and Market awareness			0.841
Continuous professional development			0.714
Alignment of sustainable construction practices			0.706
Advancement in construction materials and technologies			0.634
Financial benefit of sustainable construction			

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a Rotation converged in 11 iterations.

CONCLUSIONS

To determine the factors promoting the involvement of quantity surveyors in the delivery of sustainable housing projects. The study reveals that quantity surveyors' involvement in sustainable housing projects in Lagos is driven by a complex interplay of factors. Continuous professional development, technological advancements, and market demands emerge here as key drivers. Quantity surveyors are willing participants in this new era of technological advancement and couple with other factors, this finding cements the importance of ongoing learning and skill enhancement in adapting to the evolving demands of sustainable construction. It aligns with previous research emphasizing the need for professionals in the construction industry to continually update their knowledge and skills to effectively engage with sustainability principles. Unfortunately, the believe on the lack of incentives from the government to support sustainability in construction projects as seen in the overall mean score, possibly explains why professionals tends to focus more on tradition roles.

The research reveals an interplay of factors promoting quantity surveyors' involvement in sustainable housing projects. Continuous professional development emerges as the most significant factor, underscoring the importance of ongoing learning in this rapidly evolving field. This is closely followed by advancements in construction materials and technologies and increasing client demand and market awareness.

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