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Accessing Built Professionals Awareness and Acceptability of Lightweight Building Systems: Towards A Sustainable Building Construction Industry in Rivers State, Nigeria

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***Abstract*—Lightweight building systems promote sustainable practices in the building industry by deploying materials and techniques to building construction that hinge on ease of construction, curbing construction waste, speed of construction, reduces carbon emissions and greenhouse gases, of which the building and construction industry accounts for approximately 34% of global CO_2 emissions.**

This study assessed architects' and allied professionals' awareness and acceptability of lightweight building systems in Rivers State towards a sustainable building construction industry, addressing a significant need to bridge the gap between architects and allied professionals. A mixed-method approach was employed, combining surveys and interviews. By adopting the purposive sampling technique, a sample size of 320 respondents was obtained, comprising 90 architects and 230 allied professionals cut across builders, engineers, estate surveyors and valuers, property developers, and quantity surveyors. The primary instrument for data collection was a structured questionnaire organized into three sections; the questionnaire underwent face validation by five experts, ensuring its appropriateness and relevance. Furthermore, the instrument exhibits a high reliability coefficient of 0.96. The study finds that while architects and allied professionals in the building construction industry had a homogenous response on their awareness level and acceptability of lightweight building systems in building construction in Rivers State, architects demonstrate slightly higher awareness, and both architects and allied professionals in the building construction industry suggest that lightweight systems are moderately to highly acceptable in the building construction industry. The findings highlight a generally positive perception of the awareness and acceptability of lightweight building systems in the building construction industry in Rivers State due to the many benefits it offers. This study recommends mandatory interdisciplinary professional development: professional bodies like the Nigerian Institute of Architects (NIA), the Nigerian Institute of Building (NIOB), and the Nigerian Society of Engineers (NSE) should jointly organize mandatory continuing professional development (CPD) programs focused on lightweight building systems to boost the awareness and acceptability in the industry.

***Index Terms*—lightweight, building, systems, construction, industry.**

I. INTRODUCTION

Lightweight building systems are structural frameworks designed to minimize the total mass of a building while maintaining or exceeding the strength and durability of traditional "heavy" construction (Symetrix, 2024). Lightweight building systems have moved from experimental methods to mainstream, driven by the need for faster, easier and affordable building construction with a lower carbon footprint which is one of the sustainable development goals which is primarily driven by SDG 13: Climate action, (United Nations, 2025).

Lightweight is a term in the building and construction sector that refers to materials and structures that possess a low density or weight compared to their size or volume. The essence of its usage is the reduction of the entire structural weight; its usage in construction is basically to reduce the quantity of materials used and save cost. Invariably, lightweight materials cover many products, such as concrete, insulation, roofing materials, beams, and columns (E - Man Construo, 2024). Almeida et al, (2005) contented to the utilization of the reduced weight of construction materials and systems in order to minimize some environmental damages and costs.

II. LITERATURE REVIEW

Lightweight building systems consist of different systems that are deployed and used together to achieving a lightweight system, Modular construct, insulated concrete forms, Cross Laminated Timber (CLT), Structural Insulated Panels, Expanded Polystyrene (EPS), Glass Fiber Reinforced Polymer, Panelized Systems, Lightweight Concrete, Light-gauge Steel Framing. These form the concept for the light weight building system.

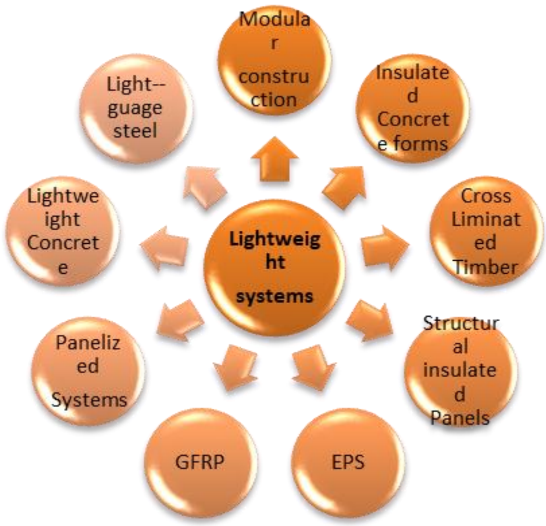

Figure 1: Conceptual Framework Design.

Source: Researcher; Chima I. N 2025.

2.1. Modular Construction

Modular construction generally describes the aspect of building construction that is carried out in a factory and delivered to site for assembly for the end-user. This process involves planning, designing, fabricating, transporting, and assembling building elements for rapid site assembly to a greater degree of finish than it is in traditional piecemeal on-site construction (Davies et al., 2018; Rogan, Lawson et al., 2000). It is for this reason that modular construction is also sometimes referred to as offsite or volumetric construction.

Study by Bert, Menaha, and Joseph (2022) in the UK and Adedamola and Olumuyiwa (2024) in Nigeria underscores the transformative potential of modular construction. These studies suggest that modularity can reduce construction timelines by up to 50% and material waste by 83% (Mohammadamin et al., 2025).

Pate 1: Image of storey building with modular construction.

Source: World Orgs 2024.

2.2. Insulated Concrete Forms

Insulated concrete forms are hollow blocks with foam which are stacked together depicting the outside walls of the building; the walls are reinforced with steel using solid materials for its solidification. These form series of insulations to the building. ICF's are superior to concrete slabs and wooden structure. (Oleck, Habel, & Herrit, 2012).

Plate 2: Image of a Concrete Insulated Forms in building construction

Source: Dry Direct 2024.

2.3. Cross-laminated Timber

Cross-laminated timber has a significantly lower Global Warming Potential (GWP) than steel or concrete, sometimes acting as a net carbon sink by storing carbon, Panels are prefabricated with CNC machinery, allowing for fast, precise assembly on-site with minimal waste. It offers high Structural Performance and stability with dimensional accuracy. It is roughly five times lighter than concrete, reducing foundation loads. Emerging eco-friendly materials such as Cross-Laminated Timber (CLT) and Structural Insulated Panels (SIPs) also feature prominently.

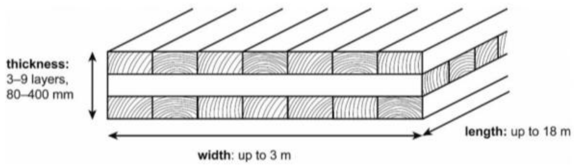

Figure 2: Cross section of Cross-laminated timber.

Source: Ljunggrena, Fredrikssonb, Johanssonb, & Kalagasidisc, 2025.

Smyth (2018) and Ying et al. (2016) argue that CLT is a "carbon negative" building material capable of reducing CO_2 emissions by over 40%. In the Nigerian context, however, adoption remains limited to secondary components like partitions and doors (Dele et al., 2024).

2.4. Structural Insulated Panels

Structural insulated panels (SIPs) are modern construction method, structural insulated panels refer to building methods that serve as alternative to the traditional ones in terms of using bricks and blocks (Carfield, 2022) presently they are used often by people as one of the modern methods of construction. Structural insulated panels (SIPs) are watertight, they are fast in building construction, the panels are basically used for the construction of external walls, and it's also serves as internal load bearing walls and that of the roof panels.

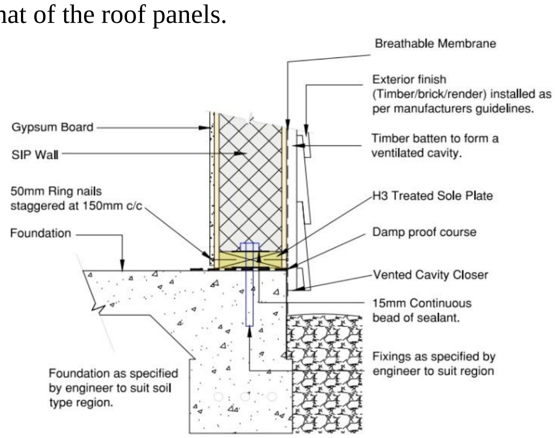

Fig 3: Detail of a Structural Insulated Panel Wall Section.

Source: Wood Solutions 2024.

Plate 3: Image of a Structural Insulated Panel wall

Source: Sips Modular Home 2024.

2.5. Expanded Polystyrene Blocks

Expanded polystyrene blocks is a sustainable lightweight system that is recyclable and environmentally friendly, The lifecycle of EPS has been studied, documented and proven to leave a smaller footprint on our planet than comparable materials making it an ideal option for eco-conscious projects, also despite their lightweight nature, EPS Blocks offer high compressive strength, making them suitable for load-bearing applications. (Moudud, et al., 2023) (Muneeb, Adeel, Riyadh, & Muhammad, 2025).

Plate 4: Image of Expanded Polystyrene Blocksfor building construction

Source: Styrotex 2025.

2.6. Glass Fiber Reinforced Polymer

Glass Fiber Reinforced Polymer (GFRP) bars typically weighs approximately 75% less than traditional steel reinforcement of the same nominal bar size. This significant reduction in weight improves transport efficiency, simplifies handling on site, and helps reduce manual handling risks during installation, (Danterr, 2020). It is highly durable and corrosion-resistant, it offers a lightweight, non-conductive alternative to steel for construction, infrastructure, marine, and industrial applications, (Okuma, Obaseki, Ofuyekpone, & Ashibudike, 2023).

Plate 5: Image of Glass Fiber Reinforced Polymer (GFRP) Bars.

Source: Suncon, 2025.

2.7. Panelized Building Systems

Panelized building systems are referred to as a kind of construction in which every material for the building is transported to site; components are produced into panels in a controlled situation offsite in factory and taken to the building site for assemble. (Panelised Building System- offsite, 2023). The factory production of these panelized systems allows for precise dimensioning, controlled material application, and consistent quality, leading to improved structural accuracy and reduced material waste compared to traditional methods (Gibbs & Williams, 2012).

Plate 6: Image of a Panelized section for building construction

Source: Painter, 2024.

2.8. Lightweight Concrete

Lightweight concrete (LWC) has emerged as a transformative material in sustainable and high-performance construction, driven by innovations in engineered lightweight aggregates, supplementary cementitious materials (SCMs), fiber reinforcements, and geopolymer binders.

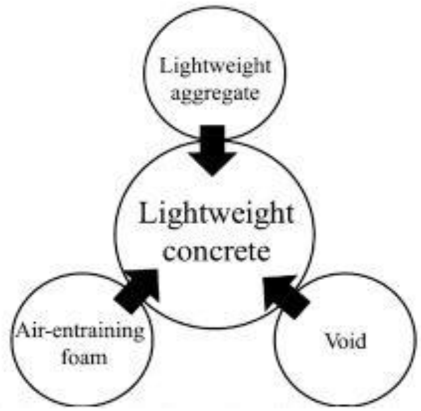

Figure 4: Typical method to Produce Lightweight Concrete.

Source: Sukmin, Tomoya, Takatsune, & Hirozo, 2015.

These advancements have enabled LWC to achieve compressive strengths surpassing 100 MPa while reducing density by up to 30% compared to conventional concrete. (Diptikar, Kuang-Yen, Firmansyah, & Aman, 2025). British standard (BS EN: 206-1), (British Standards Institution, 2013) specifies the lightweight concrete of the density values between 800 and 2000 kg/m^3 and compressive strength values between 8 and 80 MPa, (Prasittisopin, Termkhajornkit, & Kim, 2022).

2.9. Light-Gauge Steel Framing

Light-Gauge Steel Framing (LGSF) is a contemporary building technique that uses cold-formed, galvanized steel sheets to fabricate structural elements such as studs, joists, and trusses. It is widely valued for being lightweight, strong and 30–50% quicker to construct than conventional techniques, making it perfect for modular, commercial, and residential constructions, (O'Donoghue, 2023) (tatasteelcolors, 2020). Cold-Formed Light Gauge Steel Frame technology is about one-third the weight of conventional construction materials and offers twice the speed. It is highly advantageous for its strength-to-weight ratio, seismic and wind resistance, and better resistance to pests and mold. LGSF is an eco-friendly option and can be constructed using a non-combustible, environmentally controlled production technique with a high degree of accuracy, (Digitalpicasso, 2026).

Plate 7: Image of Light-Gauge Steel Framing for building construction

Source: Prefabex 2020.

2.10. Comparative Analysis

This comparative cost analysis show cases summary of studies on the different concepts this research looked into, highlighting key drivers in cost saving of building construction with lightweight system as against traditional construction systems.

Table 1: Review of comparative cost analysis

Study Year	Lightweight System	Traditional System	Project Type / Location	Initial Cost Difference	Total/ Lifecycle cost Saving	Time Savings	Key Drivers of Saving
Gorgolewski et al (2019)	Light Gauge Steels (LGS)	Structural Steel (SS) + Reinforced Concrete	Low-mid-rise residential	Expensive by 15 – 20%	Lower/Cheaper by 12% over 50 years	30% Faster	Lower Weight, faster erection, energy efficiency
Brandner et al (2016/2020)	Cross-Laminated Timber (CLT)	Concrete Steel Frame	Performing arts facility (U.S. West Coast)	Cheaper 5 – 10%	Lower/Cheaper by 8 – 12% over 30 – 100 Years	20 – 25%	Prefabrication, reduced labor
Boyajian (2019)	Cellular Lightweight Concrete (CLC) Blocks	Burnt Clay Bricks	Residential walling (India)	Cheaper by 8%	Lower by 12 – 18% (walling & Lifecycle)		60% less weight & lower foundation cost
Gupta & Sharma (2021)	Prefabricated Lightweight Concrete Panel	Cast-in-situ RCC	Multi-Story office (India)	Cheaper by 4% (steel Content)	Lower/ Cheaper by 8 – 12% in cost	40% faster	Lower Indirect costs (overheads) & Transport savings
Palumbo et al. (2016/2023)	Wood / CLT (Lightweight)	Concrete / Brick (Heavyweight)	Residential (Italy, Mediterranean)	Similar	10 – 15% (100year lifecycle)	Not Primary focus	15% lower energy, low maintenance
Patel & Patel (2016)	Precast Lightweight Concrete	Reinforced Cement Concrete (RCC)	5 Story Residential Building (India)	15 – 18% Expensive	15 – 18% Lower/cheaper	35% Faster	Less Material, faster erection

2.11. Aim of the Study

This study aims to Accessing Built Professionals awareness and acceptability of lightweight building systems towards a Sustainable Building Construction Industry in Rivers State, the study sought the following;

1. Determine the awareness level of lightweight building systems in the building construction industry in Rivers State.
2. Investigate the acceptability of lightweight building systems in the building construction industry in Rivers State.

2.12. Research Questions

The following research questions guided the study

1. What is the awareness level of lightweight building systems in the building construction industry in Rivers State?

2. How acceptable are lightweight building systems in the building construction industry in Rivers State?

2.13. Hypotheses

The following hypotheses were formulated and will be tested at a .05 level of significance:

$H0_1$ There is no significant difference between the mean responses of Architects and Allied professionals in building construction industry (APBCI) in Rivers State on the awareness level of lightweight building systems in the building construction industry in Rivers State.

$H0_2$ There is no significant difference between the mean responses of Architects and Allied professionals in building construction industry (APBCI) in Rivers State on how acceptable lightweight building systems are in the building construction industry in Rivers State.

III. RESEARCH METHODOLOGY

This study adopted a descriptive survey research design, selected for its suitability in eliciting data and information on lightweight building systems for residential building construction in Rivers State. The descriptive survey design was particularly relevant as it allowed for a comprehensive exploration of the sample, consisting of architects and Allied professionals in building construction industry (APBCI) who engages residential building construction in Rivers State, which serves as a representative subset of the larger population.

3.1. Study Area

The area of this study is Rivers State, Nigeria. Rivers State is one of the 36 states of Nigeria. Its capital is Port Harcourt; the state has 23 local government areas shared into three senatorial districts. Fig 5 shows the map of Rivers State and the 23 local government which makes ups the State bounded by neighboring state.

3.2. Population and Sample

The population is 1,402 which the make was as follows: 308 Architects (NIA), 258 Engineers (NSE / NICE), 67 Builders (NIOB), 445 Estate Surveyors & Valuers (NIEVS), 24 Quantity Surveyors (NIQS) and 300 Real Estate Developers (REDAN).

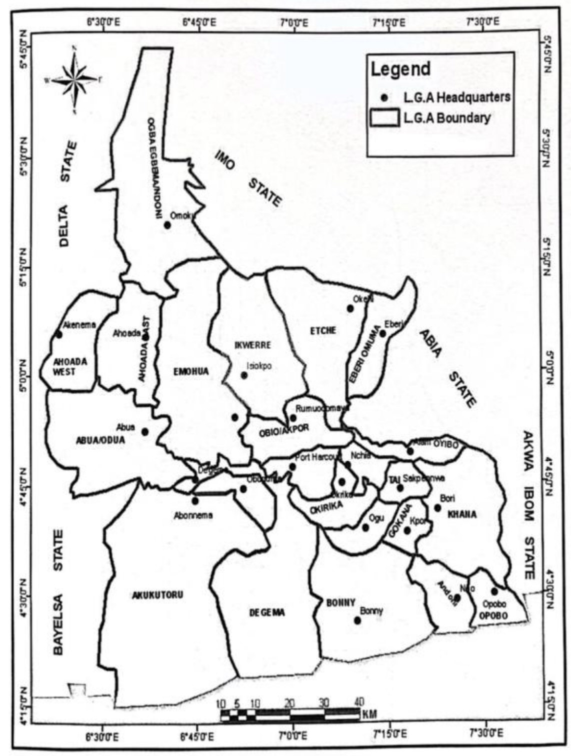

Figure 5: Map of Rivers State showing the 23 local government areas.

Source: Rivers State Ministry of Lands and Survey 2022.

Purposive sampling was adopted due to the specificity of the population which involved building professional in residential building construction. A sample size of 320 respondents was obtained, comprising 90 architects and 230 allied professionals cut across Builders, Engineers, Estate Surveyor and Valuer, Property Developer and Quantity Surveyor.

3.3. Instrument for Data Collection

The primary instrument for data collection was a structured questionnaire titled: Lightweight Building Systems Questionnaire organized into two sections; the questionnaire underwent face-validation by five experts, ensuring its appropriateness and relevance. Respondents are requested to provide their responses on a five-point Likert-type rating scale, ranging from (Very High Extent "VHE", High Extent "HE", Moderate Extent "ME", Low Extent "LE", Very Low Extent "VLE" and Strongly Agree "SA", Agree "A", Uncertain or Neutral "U", Disagree "D", Strongly Disagree "SD") with assigned values of 5, 4, 3, 2, and 1 respectively.

3.4. Instrument for Data Collection

Data collected from respondents were subjected to a rigorous analysis using mean and standard deviation to address the research questions. Additionally, t-test statistics were employed to test null hypotheses at the 0.05 level of significance. The decision criterion for the null hypothesis was based on the comparison between the calculated value of t (t-cal) and the critical value of t (t-crit). If the t-calculated value is less than or equal to the critical value, the null hypothesis is accepted; otherwise, it is rejected. The entire statistical analysis, including the computation of mean, standard deviation, and t-test, was conducted using the Statistical Package for Social Sciences (SPSS) version 25 and Microsoft excel.

This methodology ensures a strong and broad investigation of lightweight building systems specifically for residential building construction in Rivers State in Nigeria, providing valuable insights into the perceptions and experiences of Architects and Allied professionals in building construction industry (APBCI) on their awareness and acceptability of these systems.

3.5. Ethical Considerations

This research rigorously upheld ethical standards throughout its engagement with human participants. Each participant provided informed consent, wherein the study's purpose, procedures, potential risks, and benefits were transparently elucidated. Participants were assured of the confidentiality and anonymity of their responses, with coded identifiers utilized to safeguard their identities in reporting. Robust data security protocols were meticulously implemented to ensure the secure storage and transmission of information. The privacy of participants was diligently respected throughout the research endeavour, with conscientious efforts made to minimize any intrusion into their personal lives and spaces. Following the conclusion of the study, a comprehensive debriefing session was conducted, addressing participant concerns, clarifying any misconceptions, and providing a holistic understanding of the research's broader context. Participants retained the unequivocal right to withdraw from the study at any stage without encountering negative repercussions. Approval from the institutional ethical review board was diligently obtained, and the study meticulously adhered to all prescribed guidelines and recommendations.

Maintaining open and transparent communication channels with participants, sponsors, and stakeholders, the research was conducted with a profound sense of cultural sensitivity. Methodologies were adapted to align with diverse norms and values, ensuring that the research process respected and resonated with the cultural contexts of all involved parties. This comprehensive ethical approach underscores the paramount importance accorded to the well-being and rights of participants throughout every phase of the research journey.

IV. RESULTS

Research Question 1: What is the awareness level of lightweight building systems in the building construction industry in Rivers State?

Table 2: Mean Responses of Architects and Allied Professionals in the building construction industry on the awareness level of lightweight building systems in the building construction industry in Rivers State.

	Row Description	Architects $\overline{X}$	SD	RMK	Allied Professionals $\overline{X}$	SD	RMK
1.	I am familiar with the concept of modular construction.	3.33	1.059	Moderate Extent	3.00	0.781	Moderate Extent
2.	I know what panelized systems are and their potential applications.	3.55	1.350	High Extent	3.34	0.759	Moderate Extent
3.	I am knowledgeable about structural insulated panels (SIPs) and their use in building construction.	3.33	0.821	Moderate Extent	3.56	0.826	High Extent
4.	I am familiar with insulated concrete forms (ICFs) and	3.33	0.821	Moderate Extent	3.21	0.932	Moderate Extent

	their purpose in the building industry.						
5.	I know about light-gauge steel framing and its potential uses.	3.55	0.836	High Extent	3.43	0.972	Moderate Extent
6.	I am familiar with lightweight timber frame construction and its application.	3.55	0.961	High Extent	3.60	0.968	High Extent
7.	I know what prefabricated systems are and their role in building construction.	4.00	1.059	High Extent	3.73	0.793	High Extent
8.	I know what expanded polystyrene (EPS) blocks are and their potential uses in building insulation and construction.	3.44	1.171	Moderate Extent	3.21	1.021	Moderate Extent
9.	I understand the benefits of using Glass Fiber Reinforced Polymer (GFRP) panels in building construction.	3.44	1.264	Moderate Extent	3.30	0.999	Moderate Extent
10.	I am familiar with bamboo framing and its applications in construction.	3.77	1.036	High Extent	3.65	0.916	High Extent
	Grand Mean	3.529	1.0378	High Extent	3.403	0.8967	Moderate Extent

Data in Table 2 reveal that the mean and standard deviation of individual questions which makes up research question 1. Architects had a mean range of 3.33 – 4.00 and a standard deviation of 0.821 – 1.350, while the Allied professionals in the building construction industry had a mean range of 3.00 – 3.73 and a standard deviation of 0.759 – 1.021. With a grand mean difference or 0.125 and standard deviation difference of 0.1411, the closeness showed the homogeneity of the respondent's opinions. The respondent's choice shows the awareness level of lightweight building systems in the building construction industry in Rivers State.

Research Question 2: How acceptable are lightweight building systems in the building construction industry in Rivers State?

Table 3: Mean Responses of Architects and Allied Professionals in the building construction industry on how acceptable are lightweight building systems in the building construction industry in Rivers State.

	Row Description	Architects $\overline{X}$	SD	RMK	Allied Professionals $\overline{X}$	SD	RMK
1.	I find the use of modular construction to be a suitable solution for building projects.	3.55	0.961	Agree	3.65	0.815	Agree
2.	I endorse the use of panelized system in the construction industry.	4.11	0.999	Agree	4.00	0.660	Agree
3.	I recommend structural panels as a valuable addition to building projects.	4.00	1.059	Agree	4.08	0.777	Agree
4.	I consider insulated concrete forms (ICFs) to be a good fit for construction.	3.77	0.921	Agree	4.08	0.655	Agree

5.	I find the use of light-gauge steel framing effective for residential building construction.	3.66	0.821	Agree	3.78	0.779	Agree
6.	I accept prefabricated systems as valid building systems in the construction industry.	4.22	1.036	Agree	4.08	0.655	Agree
7.	I support the use of lightweight timber frame construction for residential building purposes.	3.55	1.264	Agree	4.04	0.691	Agree
8.	I recommend expanded polystyrene (EPS) blocks as a practical system for building construction.	3.44	1.171	Neutral	3.21	1.021	Neutral
9.	I view glass-reinforced fiber polymer panels as a viable option for building projects.	3.88	1.203	Agree	3.43	1.137	Neutral
10.	I consider bamboo framing to be a suitable system for residential building projects.	3.66	1.570	Agree	2.73	0.793	Neutral
	Grand Mean	3.784	1.1005	Agree	3.708	0.7983	Agree

Table 3 is the result of an independent sample t-test comparing the mean responses between Architects and Allied Professional in the building construction industry (APBCI) in Rivers State on how acceptable lightweight building systems are in the building construction industry in Rivers State. The data revealed that the mean of Architects is 3.784 and a standard deviation of 1.1005, while the Allied professional a mean of 3.708 and a standard deviation 0.7983 was record. The calculated t-Cal of 0.596 since the significant value t-Crit of 2.262 with ($P(T<=t)$ two-tail is 0.56) which is more than 0.05, the null hypothesis was Accepted. The decision rule criterion for the null hypothesis was based on the comparison between the calculated value of t (t-cal) and the critical value of t (t-crit). If the t-calculated value is less than or equal to the critical value, the null hypothesis is accepted; otherwise, it is rejected. Thus, there is no statistically significant difference in the mean response of Architects and Allied professionals in the building construction industry in Rivers State on how acceptable lightweight building systems are in the building construction industry in Rivers State.

Hypotheses

$H0_1$: The awareness level of lightweight building systems in the building construction industry in Rivers State.

Table 4: Independent Sample T-Test between: Architects and Allied Professionals in the building construction (APBCI) Industry in Rivers State on the awareness level of lightweight building systems in the building construction industry in Rivers State.

Respondents	NO	$\overline{X}$	SD	Df	t-Cal	t-Crit	P	Decision Rule
Architects	90	3.529	1.0378					
				319	2.448	2.262	0.05	Reject
Allied Professionals	230	3.403	0.8967					

Table 4 is the result of an independent sample t-test comparing the mean responses between Architects and Allied Professional in the building construction industry (APBCI) in Rivers State on the awareness level of lightweight building systems in the building construction industry in Rivers State. The data revealed that the mean of Architects is 3.529 and a standard deviation of 1.0378, while the Allied professional a mean of 3.403 and a standard deviation 0.8967 was record. The calculated t-Cal of 2.448 since the significant value t-Crit of 2.262 with (P(T<=t) two-tail is 0.03) which is less than 0.05, the null hypothesis was rejected. The decision rule criterion for the null hypothesis was based on the comparison between the calculated value of t (t-cal) and the critical value of t (t-crit). If the t-calculated value is less than or equal to the critical value, the null hypothesis is accepted; otherwise, it is rejected. Thus, there is a statistically significant difference in the mean response of Architects and Allied professionals in the building construction industry in Rivers State on the awareness level of lightweight building systems in the building construction industry in Rivers State.

$H0_2$: How acceptable lightweight building systems are in the building construction industry in Rivers State.

Table 5: Independent Sample T-Test between: Architects and Allied Professionals in the building construction (APBCI) Industry in Rivers State on how acceptable lightweight building systems are in the building construction industry in Rivers State.

Respondents	NO	$\overline{X}$	SD	Df	t-Cal	t-Crit	P	Decision Rule
Architects	90	3.784	1.1005					
				319	0.596	2.262	0.05	Accept
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4.1. Discussion:

Research Question 1 revealed that Architects had a mean range and standard deviation of individual questions which makes up research question 1, this highlights that Architects had a mean range of 3.33 – 4.00 and a standard deviation of 0.821 – 1.350, while the Allied professionals in the building construction industry had a mean range of 3.00 – 3.73 and a standard deviation of 0.759 – 1.021. The closeness showed the homogeneity of the respondent’s opinions. The respondent’s choice shows the awareness level of lightweight building systems in the building construction industry in Rivers State.

Table 4 is the result of an independent sample t-test comparing the mean responses between Architects and Allied Professional in the building construction industry (APBCI) in Rivers State on the awareness level of lightweight building systems in the building construction industry in Rivers State. The data revealed that the mean of Architects is 3.529 and a standard deviation of 1.0378, while the Allied professional a mean of 3.403 and a standard deviation 0.8967 was record. The calculated t-Cal of 2.448 since the significant value t-Crit of 2.262 with (P(T<=t) two-tail is 0.03) which is less than 0.05, the null hypothesis was rejected. Thus, there is a statistically significant difference in the mean response of Architects and Allied professionals in the building construction industry in Rivers State on the awareness level of lightweight building systems in the building construction industry in Rivers State.

Research Question 2 revealed that the mean and standard deviation of individual questions which makes up research question 2, the Architects had a mean range of 3.44 – 4.22 and a standard deviation of 0.821 – 1.570, while the Allied professionals in the building construction industry had a mean range of

2.73 – 4.08 and a standard deviation of 0.655 – 1.137. This highlights the homogeneity of the respondent's opinions. The respondent's choice shows how acceptable are lightweight building systems in the building construction industry in Rivers State.

Table 5 is the result of an independent sample t-test comparing the mean responses between Architects and Allied Professional in the building construction industry (APBCI) in Rivers State on how acceptable lightweight building systems are in the building construction industry in Rivers State. The data revealed that the mean of Architects is 3.784 and a standard deviation of 1.1005, while the Allied professional a mean of 3.708 and a standard deviation 0.7983 was record. The calculated t-Cal of 0.596 since the significant value t-Crit of 2.262 with (P(T<=t) two-tail is 0.56) which is more than 0.05, the null hypothesis was Accepted. Thus, there is no statistically significant difference in the mean response of Architects and Allied professionals in the building construction industry in Rivers State on how acceptable lightweight building systems are in the building construction industry in Rivers State.

The awareness level of lightweight building systems in the building construction industry in Rivers State.

The findings indicate a statistically significant difference in the awareness levels of lightweight building systems between Architects (mean = 3.529, SD = 1.0378) and Allied Professionals (mean = 3.403, SD = 0.8967), with a t-value of 2.448 and a p-value of 0.03 (< 0.05), leading to the rejection of the null hypothesis. Architects demonstrate slightly higher awareness, as evidenced by their higher mean score. The mean ranges (Architects: 3.33 – 4.00; Allied Professionals: 3.00 – 3.73) and standard deviations (Architects: 0.821–1.350; Allied Professionals: 0.759 – 1.021) suggest homogeneity in opinions, indicating a general awareness of lightweight building systems across the industry.

This finding aligns with research by Kibert (2016), who notes that architects, due to their role in the design phase, are often more exposed to innovative construction technologies, including lightweight systems, compared to other professionals (Kibert, 2016). The higher awareness among Architects may be attributed to their engagement with sustainable design trends and access to technical resources, as supported by (Ogunmakinde et al, 2021), who highlight the role of architectural education in promoting awareness of sustainable construction materials (Ogunmakinde et al, 2021). However, the relatively close mean scores suggest that Allied Professionals are also becoming aware of these systems, possibly due to increasing industry emphasis on sustainability and cost-efficiency (Tam et al, 2017). The significant difference may reflect a need for targeted awareness campaigns for Allied Professionals to bridge this gap.

Acceptability of lightweight building systems in the building construction industry in Rivers State.

The analysis shows no statistically significant difference in the acceptability of lightweight building systems between Architects (mean = 3.784, SD = 1.1005) and Allied Professionals (mean = 3.708, SD = 0.7983), with a t-value of 0.596 and a p-value of 0.56 (> 0.05), leading to the acceptance of the null hypothesis. The mean ranges (Architects: 3.44 – 4.22; Allied Professionals: 2.73 – 4.08) and standard deviations (Architects: 0.821–1.570; Allied Professionals: 0.655 – 1.137) indicate homogeneous opinions, suggesting that both groups view lightweight systems as moderately to highly acceptable.

This finding is consistent with (Jaillon & Poon, 2008), who found that lightweight building systems, such as prefabricated components, are increasingly accepted in construction due to their benefits in reducing construction time and waste (Jaillon & Poon, 2008). The lack of significant difference suggests a shared recognition of these benefits, possibly driven by global trends toward sustainable construction practices (Tam et al., 2017). The slightly higher mean score for Architects may reflect their familiarity with the aesthetic and functional flexibility of lightweight systems, as noted by Kibert (2016), who emphasizes architects' preference for materials that align with modern design trends (Kibert, 2016). The homogeneity in responses underscores the potential for widespread adoption, provided other barriers, such as cost and technical expertise, are addressed.

V. CONCLUSION

This study successfully evaluated the level of awareness and acceptability of lightweight building systems among built environment professionals in Rivers State, providing critical insights into the region's trajectory toward a sustainable construction industry. By analyzing and comparing the perspectives of Architects and Allied Professionals (comprising Builders, Engineers, Estate Surveyors, Quantity Surveyors, and Property Developers), the research exposed a nuanced landscape of reception and readiness.

The empirical findings collectively reveal a critical paradox within the local construction sector: while the industry is conceptually and attitudinally receptive to lightweight building systems, a distinct knowledge and alignment gap persists between design and execution professionals.

The study's primary conclusions are summarized as follows:

The Awareness Divergence:

There is a statistically significant difference in the awareness levels of lightweight building systems between Architects and Allied Professionals. Architects demonstrate a slightly higher level of awareness.

This is primarily attributed to their design-phase exposure to innovative technologies, engagement with sustainable design trends, and access to modern educational resources, However the close mean scores indicate that Allied Professionals are progressively gaining familiarity, signalling a positive shift driven by global sustainability and cost-efficiency trends.

Unified Acceptability:

In contrast to the awareness gap, there is no statistically significant difference regarding the acceptability of these systems. Both Architects and Allied Professionals share a highly homogenous, favourable perception, viewing lightweight building systems as moderately to highly acceptable for residential construction. This shared acceptance underscores a mutual recognition of the systems' profound benefits, such as reduced construction timelines, lower structural weight, cost savings, and mitigated environmental footprints.

Path toward Industry Adoption:

The strong consensus on acceptability highlights an immense potential for widespread mainstream adoption of lightweight materials (such as modular systems, structural insulated panels, and light-gauge steel framing) across Rivers State. The primary barriers preventing mass deployment are not cultural or attitudinal, but rather structural revolving around technical expertise, inter-disciplinary trust, and information availability.

In summary, the built environment industry in Rivers State stands at a pivotal threshold. The attitudinal willingness to adopt sustainable, lightweight construction techniques is already present. To translate this psychological acceptability into tangible, widespread structural implementation, professional bodies must urgently bridge the inter-disciplinary communication divide. Implementing targeted continuing professional development (CPD) programs and establishing centralized technical knowledge hubs will be vital to equipping all stakeholders with the practical confidence required to actualize a sustainable, low-carbon building industry.

5.1. Professional and Educational Recommendations

1. Mandate Inter-disciplinary Professional Development:

Professional bodies like the Nigerian Institute of Architects (NIA), the Nigerian Institute of Building (NIOB), and the Nigerian Society of Engineers (NSE) should jointly organize mandatory continuing professional development (CPD) programs focused on lightweight building systems.

These workshops should bring together designers, builders, and engineers to share practical knowledge, discuss on-site challenges, and collaboratively develop best practices. This direct interaction would help to align the different perceptions of awareness and durability, fostering a more cohesive and trusting professional network.

2. Establish a Centralized Knowledge Hub:

A collaborative effort among professional institutions should lead to the creation of a centralized, accessible, and regularly updated online knowledge hub or a physical resource center. This hub would provide a one-stop-shop for technical specifications, material data sheets, case studies, verified supplier directories, and best practice guides for lightweight systems. This would address the information-seeking challenges identified in the data and provide professionals with the tools to confidently evaluate and implement these technologies, thus increasing their "trial-ability" and reducing perceived "complexity."

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