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Research Paper

Evaluation of Factors Influencing the Acceptability of Laterite–Cement Bricks among Workers in Ede North Local Government, As Well As the Challenges Impeding Their Effective Utilization

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Abstract: *This study assessed the acceptability of laterite-cement bricks (LCB) for housing construction among workers of Ede North Local Government in Osun State, Nigeria, with a view to designing a low-income staff housing estate. Using a total enumeration technique, structured questionnaires were administered to all 228 workers across ten departments. Data were analysed using descriptive statistics, Chi-square test of independence, and ordinal logistic regression. Findings reveal that 84% of the workforce falls within the middle-income bracket, with 56% residing in rented accommodations. Flats (60.5%) and duplexes (29.8%) were the most preferred housing typologies. Awareness of LCB was high (96.9%), and 78.3% of workers expressed high or very high acceptance. The Chi-square test confirmed a statistically significant association between source of awareness and likelihood of adoption ($\chi^2 = 22.47$; $p = 0.00016$). Ordinal regression identified durability (OR = 6.05), cost perception (OR = 3.49), availability (OR = 2.58), and technical awareness (OR = 2.46) as the strongest predictors of acceptance. Major barriers include lack of professional training (82%) and negative perceptions rooted in indigenous knowledge. The study recommends targeted awareness campaigns, professional workshops, community-based brick production centres, and policy integration of LCB into public housing schemes.*

Keywords: *Laterite-Cement Brick, Affordable Housing, Housing Acceptability, Low-Income Housing, Ede North, Nigeria*

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I. INTRODUCTION

Housing is a fundamental human need and a critical determinant of quality of life, productivity, and social well-being [1, 2]. In Nigeria, the housing deficit has been estimated at between twelve and sixteen million units, with low- and middle-income households—constituting 65% of the population—accounting for approximately 85% of total housing demand [3, 4]. This challenge is compounded by rising construction costs, rapid urbanisation, and the dominance of expensive conventional materials such as sandcrete blocks, which are overwhelmingly dependent on river sand and Portland cement [5, 6].

The search for cost-effective, locally available, and sustainable building materials has therefore become imperative. Laterite, a ferruginous and aluminous soil formed through weathering processes, is abundantly available in tropical Nigeria, particularly in Osun State [7, 8]. When combined with cement, laterite-cement bricks (LCB) offer enhanced compressive strength, good thermal insulation, and lower production costs compared to conventional sandcrete blocks [9, 10]. Several ancient laterite-brick structures in Nigeria demonstrate the material's long-term durability [11].

Despite these advantages, LCB remains underutilised, partly due to concerns about structural viability, aesthetic quality, and limited professional awareness. Existing studies have examined LCB in various contexts across Nigeria [12, 13, 14], yet there is a notable absence of research specific to Osun State and, more specifically, to the housing needs of public sector workers in semi-urban local government settings. This study bridges that gap by assessing the acceptability of LCB among Ede North Local Government workers and proposing a contextually responsive low-income staff housing estate.

II. Review Of Related Literature

2.1 Affordable Housing

Affordable housing is generally defined as housing that meets quality standards while remaining financially accessible, with housing costs not exceeding 30% of household income [15]. In Nigeria, the Federal Government's National Housing Policy (2012) targets low- and middle-income earners, but persistent challenges—including high land costs, expensive materials, and inadequate financing—have limited its impact [16, 17]. The resultant housing deficit disproportionately affects public sector workers who lack access to formal mortgage facilities.

2.2 Laterite-Cement Bricks: Properties and Performance

Laterite-cement bricks are produced from a mixture of 70–80% laterite soil and 20–30% Portland cement by volume, cured at ambient temperatures [18]. Their key advantages include: (i) cost-effectiveness, as laterite is locally sourced and does not require high-temperature firing; (ii) thermal insulation, arising from their porous microstructure; (iii) environmental sustainability, with a significantly lower carbon footprint than fired clay bricks or concrete blocks; and (iv) comparable or superior compressive strength when appropriately mixed and cured [9, 19, 20].

However, limitations include sensitivity to excessive moisture, variability in soil quality, and constraints on high-rise applications [21]. Proper curing and waterproofing are therefore essential to maximise durability. Economically, LCB reduces reliance on imported materials, supports local entrepreneurship, and lowers long-term maintenance costs [22].

2.3 Factors Influencing Material Acceptability

Studies on building material acceptability consistently identify cost perception, durability, availability, and professional endorsement as primary determinants of adoption [13, 23]. Afolami and Oyebamiji [24] found that professional guidance was central to thermal acceptance of laterite interlocking blocks in Ado-Ekiti. Afonja et al. [14] identified durability concerns and awareness gaps as key barriers in Nigerian contexts. These findings underscore the role of technical knowledge and community engagement in driving material acceptance.

III. Research Methodology

3.1 Study Area and Population

The study was conducted in Ede North Local Government Area of Osun State, located in southwestern Nigeria (latitude 7°15'N–8°00'N; longitude 4°30'E–5°45'E). The research population comprised all 240 workers across ten departments of the local government secretariat, as obtained from the Administrative Department.

3.2 Research Design and Sampling

A descriptive survey design was adopted, integrating quantitative and qualitative approaches. Given the relatively small and accessible population, total enumeration was employed, and structured questionnaires were administered to all 240 workers. Valid responses were received from 228 (response rate: 95.0%). Secondary data were sourced from academic journals, policy documents, and case studies of existing LCB housing estates. Data were collected during scheduled workdays.

3.3 Data Analysis

Quantitative data were analysed using descriptive statistics (frequencies, percentages), Chi-square test of independence, and ordinal logistic regression. Qualitative case study data were analysed through content analysis.

IV. Results And Discussion

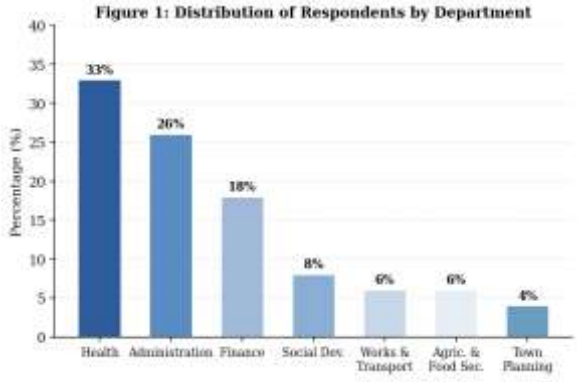
4.1 Socio-Economic Characteristics

Table 1 presents the socio-economic profile of the 228 respondents. The workforce is predominantly concentrated in the health (33%) and administration (26%) departments. A large majority (84%) fall within the middle-income bracket (₦30,000–₦120,000/month), reflecting the typical earnings of junior-to-mid-level civil servants. The age distribution indicates a young and active workforce, with 62% aged 31–40 years. Female workers (57%) slightly outnumber males, and educational attainment is high, with 88% holding NCE/OND qualifications or above.

Table 1: Socio-Economic Characteristics of Ede North Local Government Workers (N = 228)

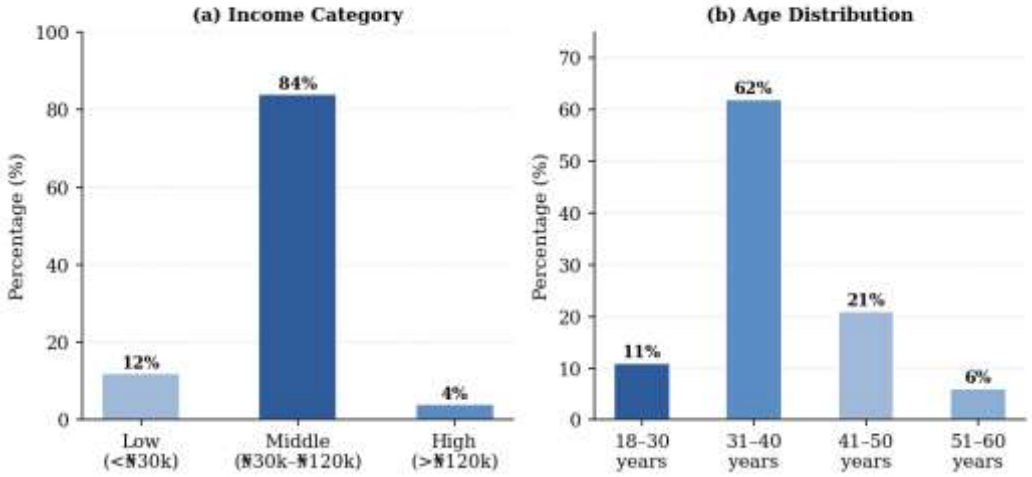
S/N	Category	Frequency (N)	Percentage (%)
1	**Department**		
	Administration	58	26.0
	Agric. & Food Security	14	6.0
	Finance	41	18.0
	Health	75	33.0
	Social Development	18	8.0
	Town Planning	9	4.0
	Works & Transport	13	6.0
2	**Income Category**		
	Low	27	12.0
	Middle	192	84.0
	High	9	4.0
3	**Age (years)**		
	18–30	25	11.0
	31–40	141	62.0
	41–50	48	21.0
	51–60	14	6.0
4	**Gender**		
	Male	98	43.0
	Female	130	57.0
5	**Educational Background**		
	No Formal Education	5	2.0
	Primary School	9	4.0
	Secondary / Technical / TTC	14	6.0
	NCE / OND	91	40.0
	HND / Degree / Postgraduate	109	48.0
6	**Marital Status**		
	Single	25	11.0
	Married	185	81.0
	Divorced / Separated / Widowed	18	8.0
7	**Monthly Income (₦000)**		
	< 30,000	9	4.0
	30,000–60,000	25	11.0
	61,000–90,000	90	39.0
	91,000–120,000	14	6.0
	> 120,000	91	40.0
	Total	**228**	**100.0**

Source: Author's Field Survey (2024/2025)



Author's Field Survey (2024/2025)

Figure 2: Income Category and Age Distribution of Workers



Source: Author's Field Survey (2024/2025)

Housing analysis (Table 2) reveals that 56% of workers live in rented accommodation, while only 41% own their homes. The high rental dependence underscores significant housing affordability constraints. Household sizes are predominantly small (71% have 1–4 members), suggesting that compact and functional housing typologies could adequately serve most workers.

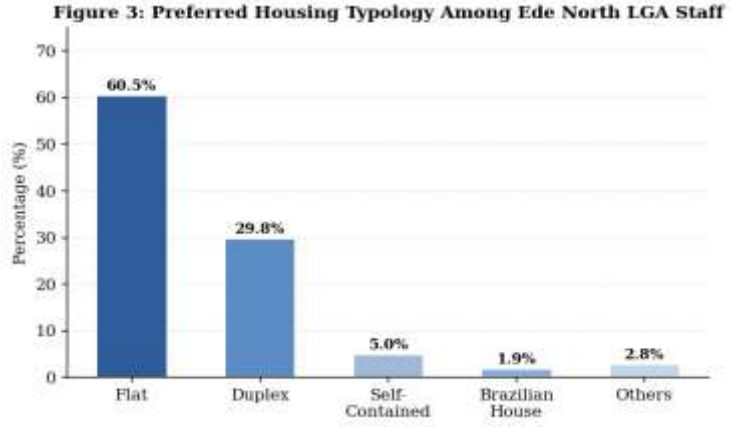
Table 2: Housing Ownership and Rent Profile (N = 228)

Category	Frequency (N)	Percentage (%)
Owner-Occupied	93	41.0
Rented	128	56.0
Squatting / Other	7	3.0
Household Size 1–4 members	162	71.0
Household Size 5–10 members	57	25.0

Source: Author's Field Survey (2024/2025)

4.2 Preferred Housing Typology

Flats were the most preferred housing type (60.5%), followed by duplexes (29.8%), reflecting workers' desire for a balance of affordability, privacy, and modern amenities. Self-contained units (5.0%) and Brazilian houses (1.9%) were least preferred, indicating a shift from traditional housing forms. These preferences align with findings from comparable studies in Akure [25] and Ilorin [26]. Durability (69.6%) and affordable maintenance (67.1%) were identified as the most critical housing features, followed by outdoor space (60.2%) and aesthetics (52.2%).



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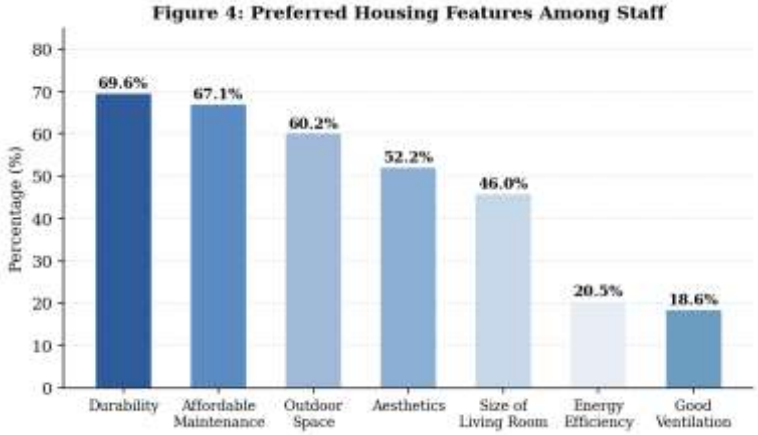
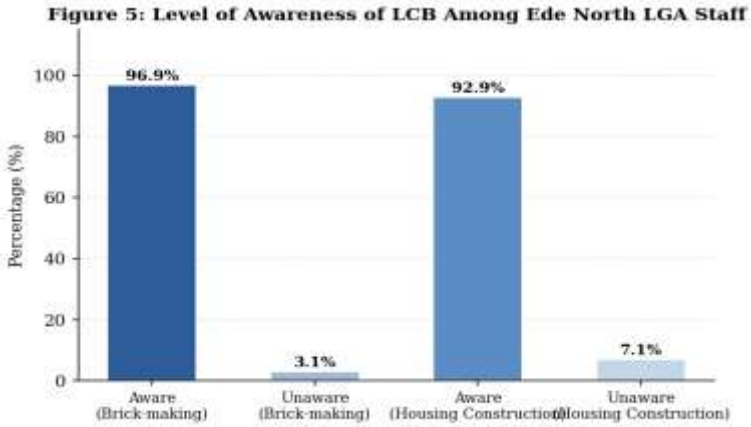


Source: Author's Field Survey (2024/2025)

4.3 Awareness and Willingness to Adopt LCB

Awareness of LCB was high: 96.9% of respondents recognised its use in brick-making, and 92.9% acknowledged its application in housing construction. Professional sources (workshops, formal education) were the primary channel of awareness for those likely to adopt LCB (61.5%), whereas those unlikely to adopt it were predominantly informed through indigenous knowledge (68.75%). This pattern suggests that professional exposure generates confidence in the material's suitability, while informal awareness alone may reinforce traditional scepticism.



Source: Author's Field Survey (2024/2025)

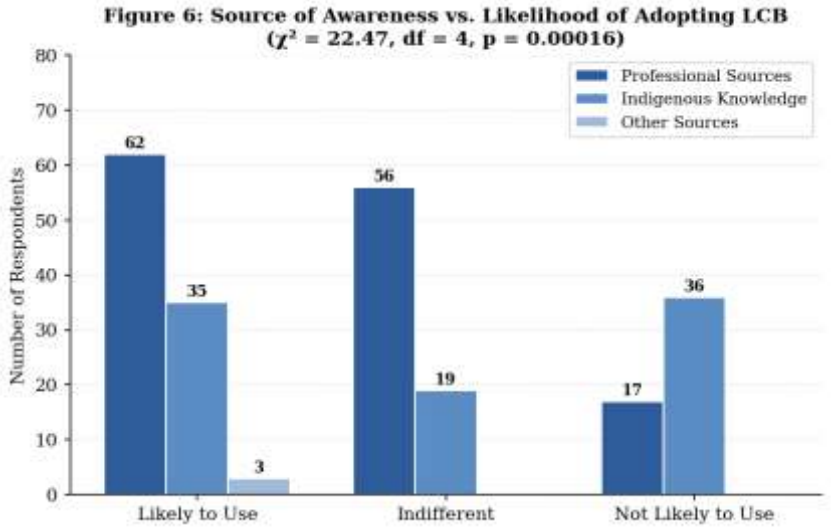
4.4 Chi-Square Test: Source of Awareness and Likelihood of Adoption

A Chi-square test of independence was conducted to determine whether a statistically significant association exists between the source of awareness and likelihood of adopting LCB (H_0 : no association; H_1 : significant association). Table 3 and Figure 6 present the cross-tabulation and visual distribution of results.

Table 3: Chi-Square Test – Source of Awareness vs. Likelihood of Using LCB (N = 228)

Source of Awareness	Likely to Use	Indifferent	Not Likely to Use	Total
Professional Sources	62	56	17	135
Indigenous Knowledge	35	19	36	90
Other Sources	3	0	0	3
Total	**100**	**75**	**53**	**228**
Pearson Chi-Square = 22.47; df = 4; p = 0.00016 (p < 0.05)				

Source: Author's Field Survey (2024/2025)



Source: Author's Field Survey (2024/2025)

Since p = 0.00016 < 0.05, the null hypothesis is rejected. There is a statistically significant association between the source of awareness and willingness to adopt LCB. Professional education and structured exposure are critical drivers of acceptance, while indigenous knowledge alone correlates with reluctance, likely due to concerns about durability and preference for familiar materials.

4.5 Ordinal Logistic Regression: Predictors of LCB Acceptability

An ordinal logistic regression model was fitted with likelihood of adoption as the dependent variable. The model was statistically significant (Likelihood Ratio $\chi^2 = 42.76$, df = 6, $p < 0.001$). Table 4 reports the parameter estimates, and Figure 7 visualises the odds ratios for each predictor.

Table 4: Ordinal Regression Parameter Estimates for LCB Acceptability

Predictor Variable	B	Std. Error	Wald χ^2	df	p-value	Exp(B) OR
Cost Perception (Affordable)	1.25	0.45	7.83	1	0.005**	3.49
Durability (Durable)	1.80	0.50	12.96	1	0.000**	6.05
Availability (Available)	0.95	0.42	5.10	1	0.024*	2.58
Appearance (Good)	0.55	0.37	2.20	1	0.138	1.73
Technical Awareness (Yes)	0.90	0.40	5.06	1	0.024*	2.46
Past Experience (Yes)	0.70	0.38	3.40	1	0.065	2.01

* p < 0.05; ** p < 0.01 | Model LR Chi-square = 42.76 (df=6, p < 0.001)						

Source: Author's Field Survey (2024/2025)

Source: Author's Field Survey (2024/2025)

Durability perception was the strongest predictor (OR = 6.05; p < 0.001). Cost perception was second (OR = 3.49; p = 0.005), followed by availability (OR = 2.58; p = 0.024) and technical awareness (OR = 2.46; p = 0.024). Aesthetic appearance and past experience did not reach statistical significance (p > 0.05). These findings align with Afolami and Oyebamiji [24] and Afonja et al. [14].

4.6 Case Study Insights

Three case studies of LCB-based housing estates informed the design proposal: (i) Brick City Estate, Abuja (Urban Shelter Ltd. / FMBN, 2012), offering 1–4-bedroom units in a gated community; (ii) Federal Low Cost Housing Estate, Oloje Phase 1, Ilorin, providing affordable 2–3-bedroom bungalows; and (iii) Olusegun Obasanjo Housing Estate, Ado-Ekiti (Ekiti State Housing Corporation / NBRRI, 2005), utilising laterite interlocking blocks. Key lessons include the importance of well-planned layouts for ventilation and lighting, the viability of LCB for flat and bungalow typologies, and the need for diversified architectural designs.

V. Design Proposal: Ede North Staff Low-Income Housing Estate

5.1 Design Concept and Brief

Based on the survey findings, a low-income staff housing estate is proposed for Ede North Local Government, utilising laterite-cement bricks as the primary construction material. The estate is designed to provide 101 housing units across three typologies calibrated to household size (Table 5): 10 self-contained units for 1–2-person households, 62 flats for 2–4-person households, and 29 duplexes for 5–6-person households.

Table 5: Proposed Housing Unit Distribution

Household Size	No. of Staff	Units Required	Building Typology
1–2	23	10	Self-contained
2–4	137	62	Flat
5–6	64	29	Duplex
Total	**224**	**101**	

Source: Author's Compilation (2025)

5.2 Design Principles

The design integrates the following evidence-based principles: (i) Orientation to capture prevailing southwest winds; (ii) Cluster layout of 4–6 units around shared courtyards; (iii) LCB walling with reinforced concrete frames; (iv) Rainwater harvesting via roof catchment systems; (v) Solar-powered street and communal lighting; (vi) Modular design for incremental expansion; and (vii) Permeable paving and concrete-lined drainage channels.

VI. Conclusion And Recommendations

6.1 Conclusion

This study has demonstrated that laterite-cement bricks are a viable, sustainable, and cost-effective material for low-income housing construction in Ede North Local Government. Awareness is high (96.9%), overall acceptance is strong (78.3%), and durability, cost, and availability are the principal drivers of adoption. The Chi-square and ordinal regression analyses confirm that professional exposure is a critical mediator of

acceptance. The proposed 101-unit housing estate offers a context-responsive and replicable model for affordable public-sector housing in semi-urban Nigeria.

6.2 Recommendations

Based on the findings, the following recommendations are proposed:

[1] Government should partner with private developers to initiate subsidised LCB housing projects, supported by cooperative mortgage schemes and land allocations.

[2] Capacity-building workshops and professional training programmes for architects, engineers, and artisans should be institutionalised to bridge the 82% identified technical knowledge gap.

[3] Community-based LCB production centres should be established in Ede North, supported by micro-credit and equipment provision.

[4] Public awareness campaigns and model housing demonstrations should be launched to address negative perceptions.

[5] Policy frameworks should formally recognise LCB in public housing procurement guidelines, with incentives such as reduced permit fees and priority land allocations.

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