

Workspace Layouts and Occupant Comfort in Nigerian Offices: A Quantitative Assessment Toward Sustainable Design

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Abstract

This paper evaluated the impact of workspace layouts on occupant comfort in Nigerian corporate offices, focusing on Lagos and Abuja. A survey-based methodology was employed, with data collected from 146 office users through structured questionnaires and analyzed using SPSS. Principal Component Analysis (PCA) identified lighting, ventilation, and noise control as key comfort factors, explaining 44.3% of the variance in satisfaction. The Hive layout (45.9%) was the most common, promoting collaboration but raising concerns about noise and distraction. While 74.7% of respondents rated natural lighting positively, 50% reported discomfort due to poor ventilation. ANOVA revealed a significant relationship between ventilation and comfort ($p = 0.006$), highlighting the need for improved air circulation. Although 81.5% affirmed that office design influences productivity, t-tests showed no significant difference between Activity-Based Working (ABW) and Cellular layouts ($p = 0.737$). Only 11% of respondents were aware of sustainability strategies, despite widespread support for renewable energy integration. The study also explores how workspace flexibility affects engagement among Nigeria's growing young workforce. Findings underscore the need for adaptable, well-ventilated workspaces that support comfort, productivity, and sustainability.

Keywords: Workspace Layouts, Occupant Comfort, Sustainability, Employee Productivity, Natural Lighting, Ventilation.

Introduction

Office space demand has significantly increased in developing regions like Africa due to the rapid growth of urban areas. With Nigeria's expanding urban population and economic growth, office buildings are being constructed in large numbers to meet diverse professional needs (Unegbu et al., 2024). Besides this, the growing presence of younger professionals in office spaces underscores the need for workplace layouts that foster flexibility, engagement, and well-being. As Gen Z and Millennials increasingly dominate urban workforces, workspace design must evolve to meet their expectations for collaborative, technologically integrated, and environmentally conscious environments. Even so, this expansion raises a key challenge, which is how to ensure office spaces are sustainable in their design and usage. The growing global emphasis on sustainability has amplified the need for environmentally responsible and energy-efficient building practices.

A study conducted by Kwon (2020) found that the building industry contributes to nearly 40% of global energy use and a significant portion of greenhouse gas emissions, underscoring the importance of integrating energy-efficient strategies early in the design process.

A workplace should enhance employee well-being while ensuring minimal environmental impact (Ifechukwu Gil-Ozoudeh et al., 2022). Similarly, emerging research by Lee et al. (2024) highlights the value of flexible workplace strategies in supporting occupant activities, enhancing collaboration, and improving satisfaction. To achieve these outcomes, architectural and technological solutions, such as biophilic design and climate-responsive systems, are critical, as they reduce health-related issues and foster productivity. Unfortunately, Nigerian office buildings often prioritize short-term efficiency and immediate comfort, resulting in underused spaces, excessive reliance on artificial energy systems, and weak environmental performance (Muhammad, 2019). Given that more people in Nigeria are moving to developing cities quickly, which have various climatic conditions, their office designs must address challenges related to natural lighting, ventilation, and spatial efficiency. The use of compact and flexible layouts, though promising, remains underexplored in Nigeria's urban and climatic contexts. Despite growing evidence that flexible designs can enhance both sustainability and user experience, traditional layouts still dominate. The findings contribute to sustainable office design in Nigeria, supporting global development goals, specifically SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action), and advocating office designs that meet both environmental and human-centered performance standards.

Problem Statement

Nigeria's office buildings rely on outdated designs that overlook occupant comfort, energy optimization, and climate responsiveness. This disconnect between sustainable design theory and actual implementation is a critical issue, especially for younger employees like Millennials and Gen Z. This study intends to fill this gap by quantitatively assessing workspace layouts' impact on comfort, satisfaction, and perceived sustainability, laying the groundwork for more informed office design policies.

Aim

To evaluate how workspace layouts influence comfort, satisfaction, and sustainability in Nigerian offices, especially for younger workers in climate-responsive environments.

Objectives

- i. Analyze the Relationship Between Workspace Layouts and Occupant Comfort.
- ii. Assessing the Impact of Different Office Layouts on Productivity and Job Satisfaction.

- iii. Examining Employee Awareness and Perceptions of Sustainable Office Design Strategies.

Theoretical Framework

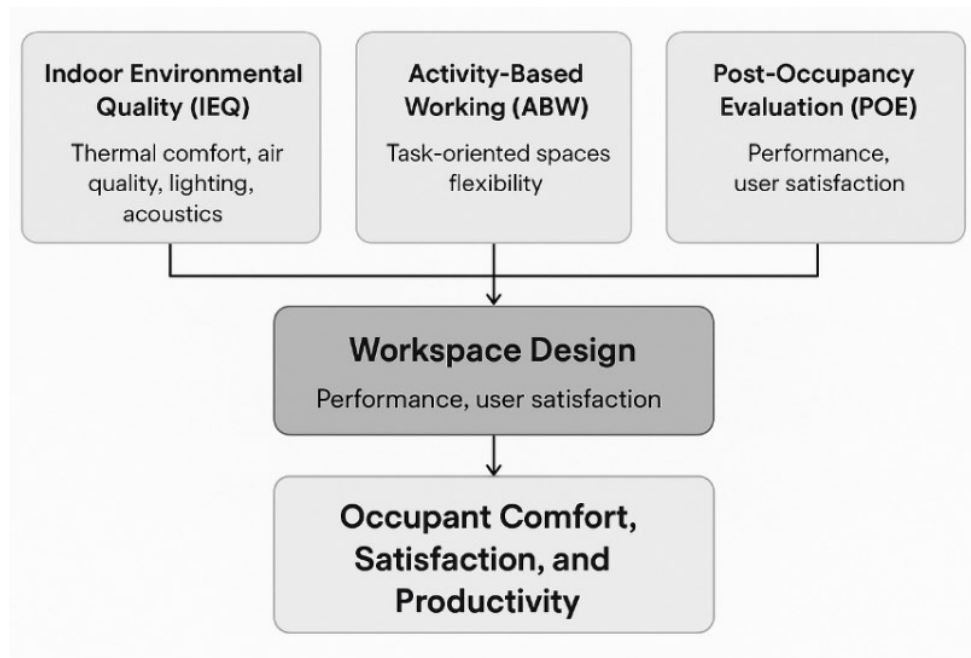


Figure 1: Theoretical framework

Source: Author generated

To guide this investigation, this study uses a multidisciplinary framework, including Environmental Comfort Theory, Indoor Environmental Quality (IEQ), Activity-Based Working (ABW), and Post-Occupancy Evaluation (POE), to investigate office environments in Nigeria. The framework emphasizes the importance of thermal conditions, air quality, lighting, and acoustics in occupant comfort, health, and performance. This integrated framework informs all aspects of the study, from the selection of IEQ metrics and ABW variables to the structure of survey tools and field protocols, ensuring a comprehensive evaluation of how office environments in Nigeria support comfort, satisfaction, and productivity.

Literature Review

Overview of the Evolution of Workspace Layouts

The evolution of workspace layouts reflects the dynamic nature of organizational needs and technological advancements (Jerab & Mabrouk, 2023). Historically, office layouts featured cellular designs, characterized by enclosed spaces that prioritized individual privacy but limited collaboration. The mid-20th century saw the rise of open-plan offices, which

eliminated partitions to promote greater interaction among employees, albeit at the expense of privacy and acoustic comfort (Ramantswana et al., 2024). In response to these limitations, the concept of Activity-Based Working (ABW) has gained prominence in recent decades. ABW introduces flexibility by offering diverse workspaces tailored to different tasks, such as quiet zones for focused work, collaborative areas for teamwork, and informal meeting spaces for casual interactions (Masoudinejad & Veitch, 2023). This shift aligns with the increasing emphasis on adaptability, sustainability, and employee well-being in office design (Itoki Global, 2015).

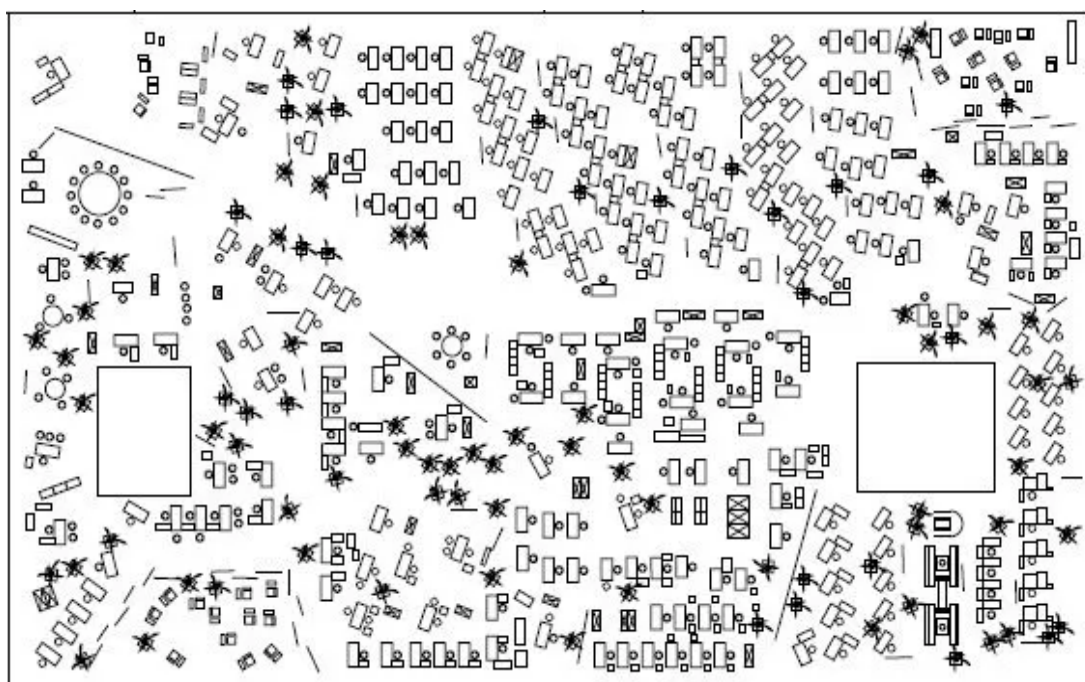


Figure 2: Quick Borner Group's Office Layout Bild Und Ton, showing the organic flows of the office landscape

Source: (Shao, 2023)

Impact of Workspace Layouts on Indoor Environmental Quality (IEQ)

The design of office layouts plays a critical role in shaping Indoor Environmental Quality (IEQ), which significantly affects occupant well-being and productivity (Sirror et al., 2024). IEQ encompasses key factors such as air quality, acoustics, lighting, and thermal comfort, all of which vary based on workspace configurations. Research suggests that ABW layouts can improve air quality and aesthetics because of their inherent flexibility and adaptability (Nanayakkaramura et al., 2024). That said, maintaining uniform thermal comfort in these spaces can be challenging as different areas may experience temperature variations due to varying occupancy and usage patterns. In research conducted by Josephine (2021), Open-plan offices, while promoting collaboration and communication, often compromise visual privacy and acoustic comfort, leading to increased distractions. Conversely, traditional

enclosed offices offer better concentration but may hinder teamwork and interaction. Despite their respective advantages and drawbacks, workspace layouts profoundly influence IEQ, which determines workplace performance and user satisfaction.

Integration of Compact and Flexible Workspace Designs

Modern workplaces increasingly adopt compact layouts to reduce spatial inefficiencies and flexible configurations like modular furniture to support adaptability and sustainability (Ahmed, 2023). These features enhance functionality and promote energy efficiency. Vinh & Moere (2024) draw attention to the fact that flexible layouts not only support collaboration and technological integration but also boost organizational agility. Gil-Ozoudeh et al. (2022) further highlight their role in reducing environmental impact, positioning them as a dual solution for functionality and sustainability.

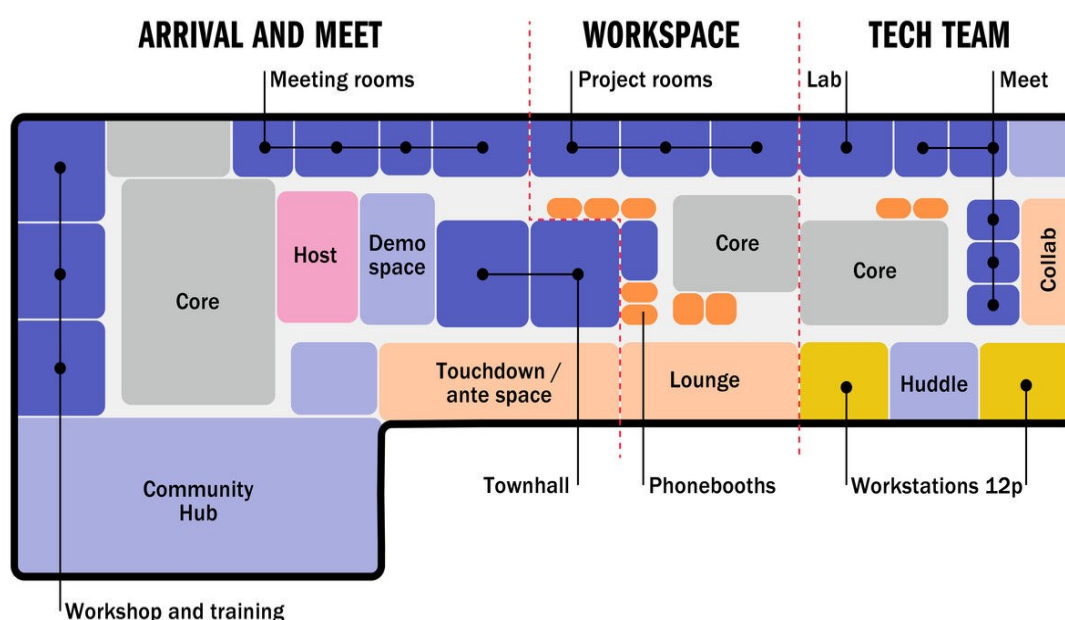


Figure 3: Floor plan showcasing a compact ABW layout with labelled zones for different activities.

Source: (Hassell Studio, 2025)

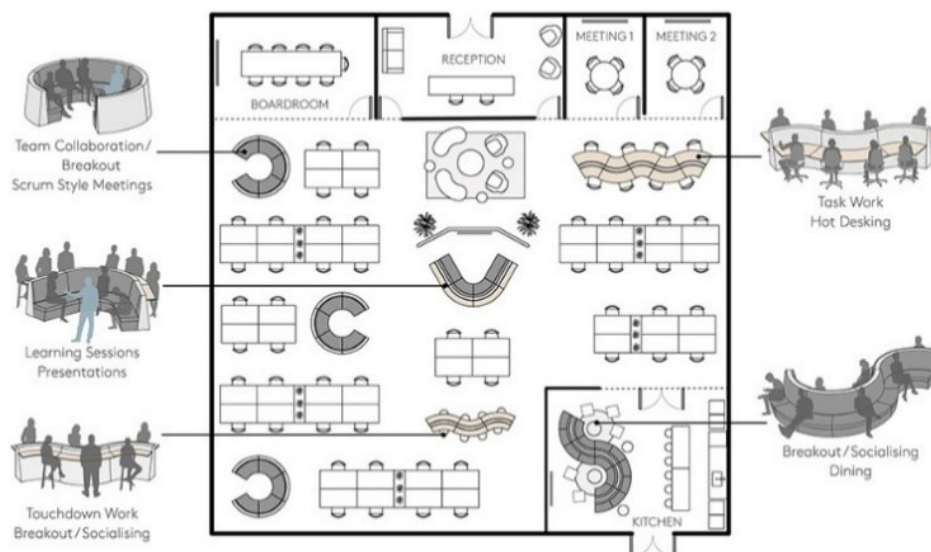


Figure 4: This floor plan features a flexible office design with modular, easily rearrangeable furniture for various work styles.

Source: (PLN Group, 2025)

Balancing Workspaces and Open Spaces

Balancing open and enclosed spaces is critical for optimizing focus and collaboration. Excessive openness can cause distractions, while too much enclosure stifles communication (Josephine, 2021). Studies show that user experience surveys and observational data provide valuable insights into how employees interact with different zones (Mahto & Sood, 2024). Flexible layouts, with mobile partitions and modular furniture, allow organizations to fine-tune spatial balance. Reconfigurable elements such as wheeled desks and sectional seating enable workspaces to evolve with organizational needs (Radogna & Kalhofer, 2022).

Post-Occupancy Evaluation (POE) in Workspace Design

Evaluating how office spaces perform after occupation is essential for validating design effectiveness and user satisfaction. Post-occupancy evaluation (POE) systematically assesses how well office layouts meet user needs in terms of functionality, comfort, and satisfaction (Bae & Martin, 2023). Survey-based POEs help identify the strengths and challenges of various office layouts based on employee feedback. A widely recognized POE framework, the Building Occupant Survey System Australia (BOSSA), enables architects and designers to gather tenant feedback to refine workspace designs. Research highlights the utility of statistical methods such as descriptive analysis, correlation tests, and regression analysis in identifying variations in occupant satisfaction across different layouts (Cheung et al., 2020). By focusing on structured questionnaire responses and observational

analysis, this research aims to provide data-driven recommendations for optimizing Nigerian office spaces.

Gaps in Existing Literature

Despite the increasing interest in contemporary workplace strategies, limited empirical research in Nigeria focuses on how different workspace layouts impact user satisfaction and productivity based on direct user feedback. While ABW is increasingly seen as an effective approach for improving workspace efficiency, few studies have examined self-reported experiences of Nigerian office workers in different layouts. Compact and flexible workspace designs have not been widely evaluated through structured surveys and real-world observations to determine their effectiveness in promoting productivity and sustainability. Addressing these gaps is essential for advancing knowledge in sustainable office design and ensuring that Nigerian workplaces align with both local and global best practices. This study will conduct structured surveys and observational assessments in Lagos and Abuja office buildings to evaluate compact and flexible workspace effectiveness.

Methodology

This research employed a survey-based research approach to evaluate the impact of workspace layouts on comfort in Nigerian offices. By integrating quantitative and qualitative data collection techniques, the approach provided a comprehensive understanding of office users' experiences regarding spatial efficiency, flexibility, and overall environmental quality. The study focused on corporate office users in Lagos and Abuja, ensuring diverse organizational representation, including private companies and government agencies. This combination strengthened the validity of the findings and ensured their practical applicability. The data collection process involved primary data collection to evaluate the workspace layouts' impact on comfort, adaptability, and sustainability. Primary data were obtained through field surveys. The surveys aimed to capture office users' experiences regarding spatial efficiency, flexibility, and overall environmental quality. A purposive sampling technique was employed to select office buildings and participants that aligned with the study's objectives, ensuring that responses reflected diverse organizational settings, including private companies and government agencies. To determine the sample size for an Infinite population, Cochran's formula for sample size determination was applied. With a margin of error of 0.07. The calculation becomes $\frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.07)^2}$, Then, $n = \frac{3.8416 \times 0.25}{0.0049}$, $n \approx 196$. Thus, the required sample size was calculated to be approximately 196 respondents, where n is the required sample size, Z represents the Z-score corresponding to a 95% confidence level (1.96), p is the estimated proportion of the population with the desired attribute (0.5, when unknown), and e is the margin of error (0.07). Using these parameters, the required sample size was approximately

196 respondents, ensuring statistical significance at a 95% confidence level with a 7% margin of error. Data was collected through an online survey administered via Google Forms, allowing for efficient distribution, remote participation, and automated response tracking.

Ethical Considerations

This study was conducted following ethical standards for research involving human participants (Vanclay et al., 2013). At Caleb University, the research design, data collection tools, and participant recruitment process were sanctioned by the supervising academic team. The participants were made aware of the study's intention, guaranteed the confidentiality of their responses, and consented to participate before they could participate. Participation was voluntary, and no identifiable information was gathered to maintain anonymity and privacy.

Results and Discussion

This section presents the findings from the SPSS analysis, structured according to the research objectives. It includes descriptive statistics, inferential analysis, and a discussion of the implications of these results in the workspace layouts as a strategy for enhancing comfort and sustainability in Nigerian offices. The results are interpreted using existing literature and supported with relevant citations from the Literature Section.

Presentation of Demographic Analysis:

Table 1: Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	83	56.8%
	Female	63	43.2%
	Total	146	100%
Highest Level of Education	Secondary School	5	3.4%
	Diploma	21	14.4%
	Bachelor's Degree	72	49.3%
	Master's Degree or Higher	48	32.9%
Office Location	Abuja	71	48.6%
	Lagos	75	51.4%
Organization Type	Government	78	53.4%
	Private	68	46.6%
Years in Current Office	Less than 1 year	25	17.1%
	1-3 years	58	39.7%
	3-5 years	39	26.7%
	More than 5 years	24	16.4%
Daily Working Hours	Less than 4 hours	1	0.7%
	4-8 hours	103	70.5%
	8-12 hours	42	28.8%

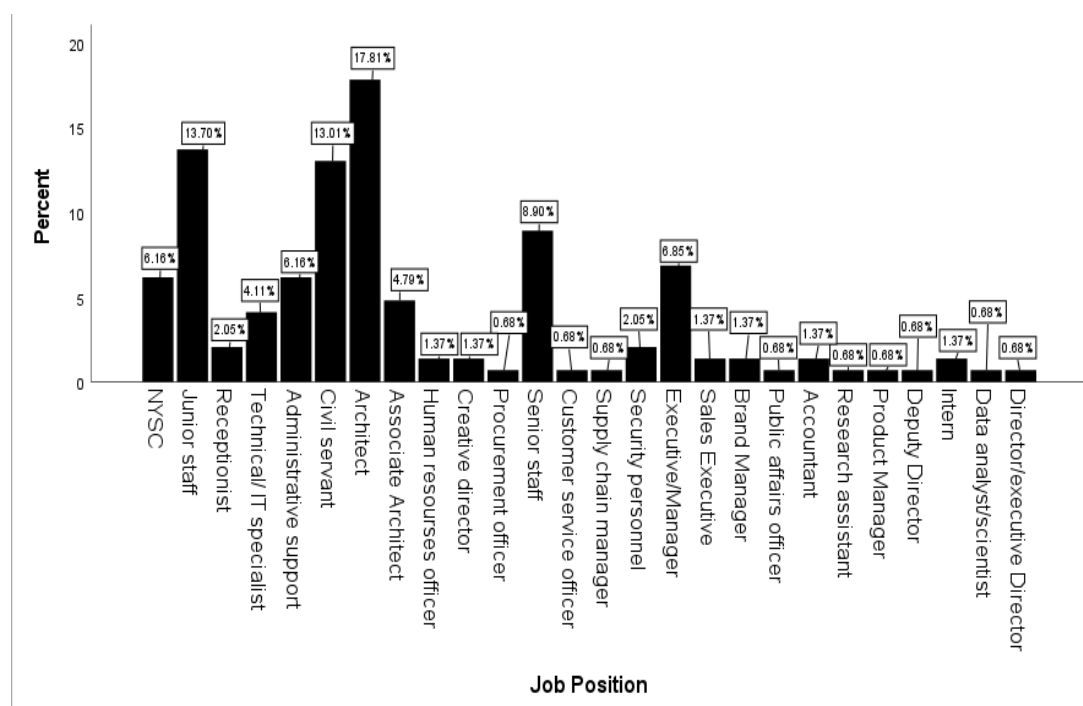


Figure 5: Simple Bar chart of job positions with their percentages

The results in Table 1 show that the demographic composition of the respondents provides an essential context for interpreting the research findings. The gender distribution reveals a near-balanced workforce, with 56.8% male and 43.2% female participants, aligning with global trends of increasing gender inclusivity in professional environments (Powell, 2018). Most respondents possess at least a bachelor's degree (49.3%), while 32.9% have a master's degree or higher. Also, the office locations of respondents represent an almost even division between Abuja (48.6%) and Lagos (51.4%), ensuring a diverse representation of perspectives from Nigeria's two major business hubs. Government (53.4%) and private sector (46.6%) employees were adequately represented, allowing comparisons between bureaucratic and corporate work environments. Job roles varied significantly, with architects (17.8%) forming the largest group, followed by civil servants (13.0%) and junior staff (13.7%). The distribution of experience levels further enhances the study's robustness, with most respondents having 1–3 years of experience (39.7%), followed by 3–5 years (26.7%), and more than five years (16.4%).

Objective 1: Analyze the Relationship Between Workspace Layouts and Occupant Comfort. This section evaluates how workspace layouts and environmental factors influence occupant comfort and usability. The results are interpreted using existing literature and statistical findings.

Table 2: Distribution of Office Workspace Layouts

	N	%
Activity-Based Working (ABW)	40	27.4%
Hive Layout	67	45.9%
Cell Layout	39	26.7%

Table 2 presents the distribution of office layouts among respondents. The most prevalent layout was the Hive layout (45.9%), followed by Activity-Based Working (ABW) (27.4%) and Cell layouts (26.7%). The dominance of the Hive layout aligns with contemporary office design trends emphasizing open-plan configurations that facilitate teamwork, collaboration, and cost-effectiveness (Marija Bogatinovska, 2024; Mohezar et al., 2021). On the other hand, while open-plan offices promote interaction, they may also introduce distractions that negatively impact concentration and productivity.

Table 3: Perceived Workspace Comfort and Environmental Factors

Factor	Category	N	%
Natural Light Satisfaction	Strongly Agree	109	74.7%
	Neutral	10	6.8%
	Strongly Disagree	27	18.5%
Ventilation Comfort	Very Comfortable	48	32.9%
	Neutral	25	17.1%
	Uncomfortable	73	50.0%
Key Comfort Factor	Good Lighting	39	26.7%
	Fresh Airflow/Ventilation	43	29.5%
	Quiet Environment	43	29.5%
	Comfortable Furniture	21	14.4%
Office Temperature Variation	Yes, frequently	45	30.8%
	Yes, sometimes	63	43.2%
	No, It's Always Comfortable	38	26.0%

Table 3 indicates that 74.7% of respondents strongly agreed that their workspace provides sufficient daylight. This finding supports studies highlighting the positive impact of natural light on reducing workplace fatigue, improving alertness, and enhancing overall well-being (Ifechukwu Gil-Ozoudeh et al., 2022). Adequate daylight exposure has been linked to increased employee satisfaction and performance, reinforcing the importance of window placement and daylight access in office design. However, 50% of respondents reported discomfort due to poor ventilation, indicating a significant challenge in maintaining indoor air quality. Poor ventilation has been associated with symptoms such as headaches, drowsiness, and decreased cognitive performance (Ahmed, 2023). Workplace thermal discomfort was a concern, as 43.2% of respondents experienced occasional temperature-related discomfort. These findings align with previous research indicating that inconsistent

thermal conditions negatively impact employees' focus and satisfaction (Gärtner et al., 2018).

It is also important to note that the study also examined primary comfort factors, with fresh airflow/ventilation and a quiet environment (both at 29.5%) being the most significant (Table 3). This highlights the necessity of designing office spaces with proper ventilation systems and acoustic controls to enhance user comfort. Prior studies confirm that noise disturbances in open-plan offices can lead to stress and reduced work efficiency (Nanayakkara et al., 2024). Beyond that, good lighting (26.7%) and comfortable furniture (14.4%) were recognized as essential elements, reinforcing the importance of ergonomic design and workplace adaptability.

Table 4: Principal Component Analysis (PCA) – Communalities in Workspace Comfort Factors

Communalities		
	Initial	Extraction
Key Comfort Factor	1.000	.443
Office Design Impact	1.000	.494
Sustainability Improvement	1.000	.268
Extraction Method: Principal Component Analysis.		

Table 4 presents communalities. Principal Component Analysis (PCA) is used to determine how much variance in each variable can be explained by the extracted factors. In this case, the table shows how strongly Key Comfort Factors, Office Design Impact, and Sustainability Improvement contribute to workspace comfort. Key Comfort Factor (0.443) suggests that nearly 44.3% of the variance in workspace comfort is explained by ergonomic elements such as lighting, ventilation, and noise control. Office Design Impact (0.494) has a higher loading (49.4%), indicating that workspace layout has a stronger influence on comfort perception.

Sustainability Improvement (0.268) has the lowest value, suggesting that sustainability improvements have a relatively weaker direct impact on comfort but may still contribute indirectly through design features like thermal efficiency and energy use.

Table 5: Component Matrix – Influence of Office Design and Comfort

Component Matrix ^a	
	Component
	1
Key Comfort Factor	.666
Office Design Impact	-.703
Sustainability Improvement	.518
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

The component matrix (Table 5) shows the strength and direction of relationships between comfort-related variables and the extracted principal component. Key Comfort Factor (0.666) had the strongest positive loading, indicating that ergonomic elements such as lighting, ventilation, and acoustic quality contribute significantly to perceived workspace comfort.

Interestingly, Office Design Impact (-0.703) exhibited a negative loading. This counterintuitive result suggests that respondents who were highly aware of design features were also more critical of their effectiveness, reflecting dissatisfaction with open-plan distractions, inadequate zoning, or poor acoustic/thermal comfort in their current layouts. This aligns with prior studies by Smollan & Morrison (2019), noting that increased design literacy can heighten expectations and lead to more critical evaluations. Sustainability Improvement (0.518), though moderately positive, had the lowest communalities value (0.268) in Table 4, indicating that while participants view sustainable strategies (like daylighting, air circulation, and greenery) favourably, these factors may not yet be integrated deeply enough into their office environments to be strongly associated with comfort. By way of contrast, it may reflect limited personal engagement or awareness of specific sustainability interventions.

Objective 2: Assessing the Impact of Different Office Layouts on Productivity and Job Satisfaction

Table 6: Utilization of Office Areas for Specific Activities & Impact of Office Design on Productivity and Job Satisfaction

Factor	Category	N	%
Office Areas for Activities	Yes, they are very useful	71	48.6%
	Yes, but they are rarely used	75	51.4%
Shared/Open Space Use	Yes, regularly	62	42.5%
	Yes, sometimes	48	32.9%
	No, I work in a private space	36	24.7%
Office Design Impact	Yes, positively	119	81.5%
	No impact	27	18.5%
Office Areas for Activities	Yes, they are very useful	71	48.6%
	Yes, but they are rarely used	75	51.4%
Shared/Open Space Use	Yes, regularly	62	42.5%
	Yes, sometimes	48	32.9%
	No, I work in a private space	36	24.7%
Office Design Impact	Yes, positively	119	81.5%

Table 6 highlights that while 48.6% of respondents find designated office areas for activities highly useful, 51.4% report their rare usage. Also, 42.5% regularly utilize shared/open spaces, whereas 24.7% prefer private workspaces. This distribution suggests that while

flexibility supports collaborative work, individual preferences still play a crucial role (Radogna & Kalhofer, 2022). Furthermore to this, 81.5% of respondents acknowledged that office design positively impacts their productivity. This result supports the findings by Norouziasas et al. (2024), who emphasized the role of flexible office layouts in enhancing efficiency and job satisfaction.

Table 7: Group Statistics Comparing Office Design Perception Across Layouts

Group Statistics							
		Type of Office Workspace Layout	N	Mean	Std. Deviation	Std. Error Mean	Error
Office Design Impact		Activity-Based Working (ABW)	40	1.18	.385	.061	
		Cell Layout	39	1.21	.409	.066	

Table 7 presents group statistics comparing different workspace layouts. The mean office design impact for Activity-Based Working (ABW) was 1.18 (SD = 0.385), while the Cell Layout had a slightly higher mean of 1.21 (SD = 0.409). Table 4.11 shows independent t-test results show no statistically significant difference (p = 0.737) in the perceived impact of office design between Activity-Based Working (ABW) layouts and Cell Layouts. This indicates that, despite the theoretical differences in flexibility and workspace organization between these layouts, their direct influence on employees' perceptions of productivity and job satisfaction is not significantly different. This suggests that while flexibility may contribute to productivity, other factors such as job role and organizational culture may mediate this effect (Nanayakkara et al., 2024).

Table 8: Independent t-Test Results – Office Design Impact by Workspace Layout

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Office Design Impact	Equal variances assumed	.456	.502	-.337	77	.737	-.030	.089	-.208	.148
	Equal variances are not assumed.			-.337	76.426	.737	-.030	.089	-.208	.148

Objective 3: Examining Employee Awareness and Perceptions of Sustainable Office Design Strategies

The results from Table 9 indicate that while awareness of energy-saving practices is low (11.0%), there is a universal inclination (100%) towards adopting renewable energy as a sustainability measure. This highlights a disconnect between knowledge and intent, where employees express strong support for sustainability but lack sufficient awareness of practical energy efficiency strategies. Similar trends have been reported by Kwon (2020), who found that office users often endorse sustainability initiatives but may not actively engage in conservation efforts due to limited knowledge.

Table 9: Awareness, Support, and Preferences for Sustainable Office Design

Factor	Category	N	%
Energy-Saving Awareness	Yes	16	11.0%
	No	130	89.0%
Support for Renewable Energy	Yes, I would	146	100.0%
Sustainability Improvement	Using renewable energy	55	37.7%
	Reducing electricity use with natural lighting	35	24.0%
	Having more plants in or around the building	18	12.3%
	Improving air circulation and ventilation	38	26.0%

The perceived sustainability improvements (Table 4.9) indicate that respondents prioritize renewable energy adoption (37.7%), improved air circulation (26.0%), and natural lighting (24.0%) as the most effective strategies. These findings reinforce the argument by Fauth & Pieper (2022) that integrating natural elements, such as daylighting and ventilation, enhances employee well-being and environmental responsibility. In addition, the 12.3% of respondents who emphasized increased greenery in and around the office space align with biophilic design principles, which have been linked to higher employee satisfaction and cognitive performance.

Table 10: ANOVA results

ANOVA			Sum of Squares	df	Mean Square	F	Sig.
Natural Light Satisfaction	Between Groups		2.129	3	.710	.282	.839
	Within Groups		357.652	142	2.519		
	Total		359.781	145			
Ventilation Comfort	Between Groups		22.016	3	7.339	4.354	.006
	Within Groups		239.360	142	1.686		
	Total		261.377	145			
Support for Greenery	Between Groups		1.260	3	.420	.558	.643
	Within Groups		106.802	142	.752		
	Total		108.062	145			

ANOVA results in Table 10 revealed a significant relationship ($p = 0.006$) between workspace ventilation and comfort, reinforcing the importance of air quality in sustainable office environments. Studies such as Gärtner et al. (2018) emphasize that ventilation is a critical factor in workplace productivity, as inadequate airflow can lead to fatigue and discomfort.

Summary of Results and Discussion

The study analyzed the impact of workspace layouts on occupant comfort, productivity, and sustainability awareness in Nigerian offices. Most responders were male and held at least a bachelor's degree. The most prevalent workspace layouts were the Hive layout (45.9%), Activity-Based Working (ABW) (27.4%), and Cell layouts (26.7%). Open plan designs like the Hive layout improved collaboration but introduced noise distractions and thermal discomfort. Lighting, ventilation, and noise control accounted for 44.3% of workspace comfort variance. Productivity was positively influenced by office design, but factors like job roles and organizational culture also played a role. Sustainability awareness was high, with 100% supporting renewable energy adoption. The study suggests that flexible, open-plan workspaces need better noise control and ventilation to improve comfort.

Conclusion

Workspace design significantly impacts employee comfort and productivity, but it is not the only factor. Based on the findings of this research, the analysis revealed that open-plan layouts like the Hive model can be noisy and ventilation-challenging. To improve well-

being, natural light, ventilation, and thermal comfort should be integrated. Personal work preferences, job roles, and organizational structures also influence workplace efficiency. The study highlights a need for energy-efficient strategies and a gap in sustainability awareness. Future research could expand the scope, compare different sectors, or incorporate longitudinal and physiological measures of comfort to better understand evolving workspace needs.

Recommendations

Enhancing Ventilation and Thermal Comfort: Employers should invest in high-efficiency ventilation systems and adaptive climate control strategies to improve air quality, reduce fatigue, and boost cognitive performance. The use of smart HVAC systems and biophilic design principles (e.g., incorporating indoor plants) should be prioritized to create healthier work environments.

- i. **Optimizing Office Layouts for Productivity:** While open-plan offices encourage collaboration, they must be balanced with private workspaces to support focused tasks. Organizations should incorporate quiet zones, breakout spaces, and soundproofing measures to mitigate noise distractions and improve work efficiency.
- ii. **Promoting Sustainable Office Environments:** Employers should integrate natural lighting solutions to minimize artificial lighting reliance and improve energy efficiency. More importantly, employee education on sustainability best practices should be introduced, as the study revealed a gap in awareness despite staunch support for renewable energy. The adoption of green building materials, energy-efficient technologies, and passive ventilation techniques can further enhance workplace sustainability.
- iii. **Customization Based on Employee Needs:** Regular workplace assessments should be conducted to evaluate employee comfort and evolving workspace needs. Organizations should consider implementing flexible office policies that allow employees to choose between hybrid work models, open workstations, or enclosed offices based on task requirements.

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