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Application of building forms and elements in enhancing users' comfort in naval conference Centres: Adaptive architectural strategies for maritime facilities

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Abstract

This study evaluates the application of building forms and elements that enhance users' comfort in the design of a Naval Conference Centre and Suites in Abuja, prompted by the rising demand for such facilities to host naval leadership while safeguarding occupant comfort. Conference facilities play a crucial role in the administrative, training and strategic operations of military and paramilitary institutions, yet Abuja‹ Nigeria's administrative capital‹ currently has no purpose-built Naval Conference Centre designed with a clear integration of comfort-enhancing forms and elements. Adopting a mixed-methods design, the study administered questionnaires to 60 respondents‹ naval officers and personnel, administrative staff, facility managers and built-environment professionals attached to relevant military formations‹ and combined these with an extensive review of the literature. Analysis in SPSS assessed four objectives: the forms and elements known to respondents, their level of integration, the barriers that inhibit integration, and the success factors that enhance it. High-quality artificial lighting was both the best-known (Mean = 3.67) and most-integrated (Mean = 3.90) element, and environmental comforts‹ lighting, air, thermal comfort, sensory control‹ dominated both measures, while spatial strategies such as biophilic integration, acoustic zoning and clarity of circulation were least recognised. Design by committee and risk aversion (Mean = 3.63) led the barriers, and comfort-led flexibility (Mean = 4.30) led the enabling factors. The findings inform best practice for the design of Naval Conference Centres and Suites in Abuja, underscoring the value of integrating climate-responsive, comfort-oriented architectural forms and elements.

Keywords: Adaptive; Building; Conference; Elements; Forms; Maritime Strategies; Users' Comfort.

1. Introduction

Contemporary architectural practice has become a key medium through which societies express cultural values, identity and technological progress (Adebayo et al., 2019; Adesuyi et al., 2024). Buildings are constructed to provide safety, comfort and protection against adverse environmental conditions, and to sustain their function and character for present and future users (Odoanyanwu et al., 2021). Ike, Barnaby, Agu and Igwegbe (2023) define building forms and elements as the overall shape, massing and volume of a structure and the way it occupies space and presents itself; forms‹ shaped by scale, proportion and massing‹ establish visual identity while also governing spatial organisation, circulation and environmental performance, and elements such as walls, roofs, openings, columns and facades define a building's aesthetic, functional and symbolic character. Well-designed forms and elements therefore shape user perception, functionality and spatial experience (Jegede & Enwonwu, 2025).

Users' comfort has become central to building performance, especially for facilities hosting large gatherings. Recent work stresses that comfort‹ thermal, visual, acoustic, spatial and psychological‹ is strongly influenced by the forms and

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elements that regulate environmental conditions and guide intuitive movement (Adewale & Ogunmakinde, 2023; Hassan & Oladapo, 2024). In a conference setting, enhanced comfort improves concentration, communication and productivity, making comfort-responsive design essential to the functioning of a Naval Conference Centre and Suites. Such facilities serve as strategic hubs for high-level naval meetings, defence symposia, trainings and cultural events, and their multifunctional character demands flexible design that supports interaction, circulation and comfort while integrating functional efficiency and security (Amachree & Enwin, 2022; Martins & Dimkpa, 2023). Given Abuja's climate, applying comfort-enhancing forms and elements is not merely desirable but necessary. This study therefore examines the forms and elements that enhance users' comfort in naval conference centres under four objectives: identifying those known to design professionals; examining the extent of their integration; identifying the barriers that inhibit it; and investigating the critical success factors that would encourage their continued application in such strategic building types.

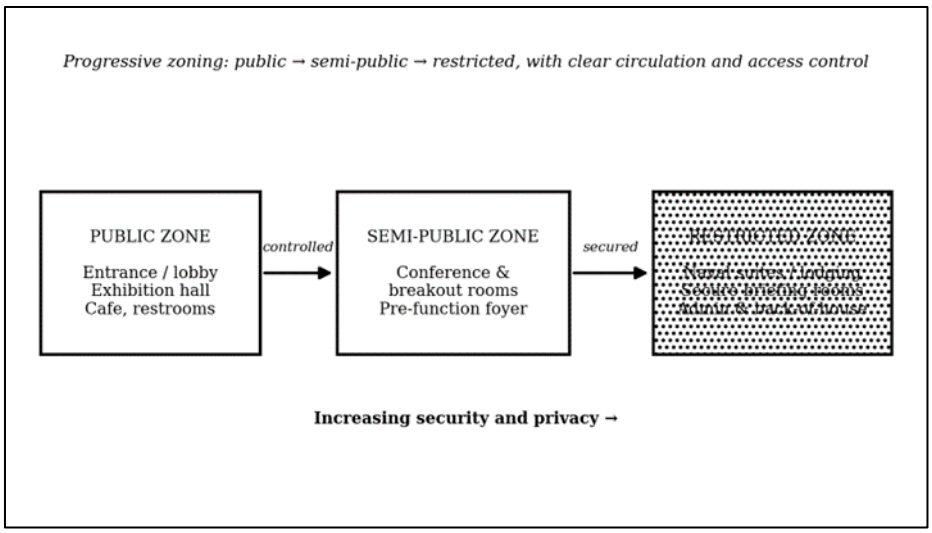
2. Literature Review

2.1. Architectural Elements Influencing User Comfort

User comfort in conference environments is shaped by architectural elements that support physical, psychological and environmental well-being. According to Lawson et al. (2022), such elements influence how individuals perceive, navigate and interact with built space, ultimately affecting productivity, concentration and satisfaction. In facilities designed for high-level deliberation, security briefings and professional gatherings, comfort becomes a critical design priority spanning five interacting dimensions‹ thermal, visual, acoustic, spatial and psychological‹ each shaped by specific forms and elements, as Figure 3 summarises.

2.1.1. Spatial Layout and Zoning

Effective spatial layout ensures clear circulation, functional zoning and well-organised activity areas. Danjuma, Ajayi and Daramola (2025) emphasise that conference environments require layouts that minimise congestion, reduce travel distances and promote intuitive navigation. For a facility that combines conferencing, lodging and naval functions, zoning into public, semi-public and restricted areas is crucial (Figure 1), progressing from open public space through controlled semi-public rooms to secured naval suites and briefing areas.

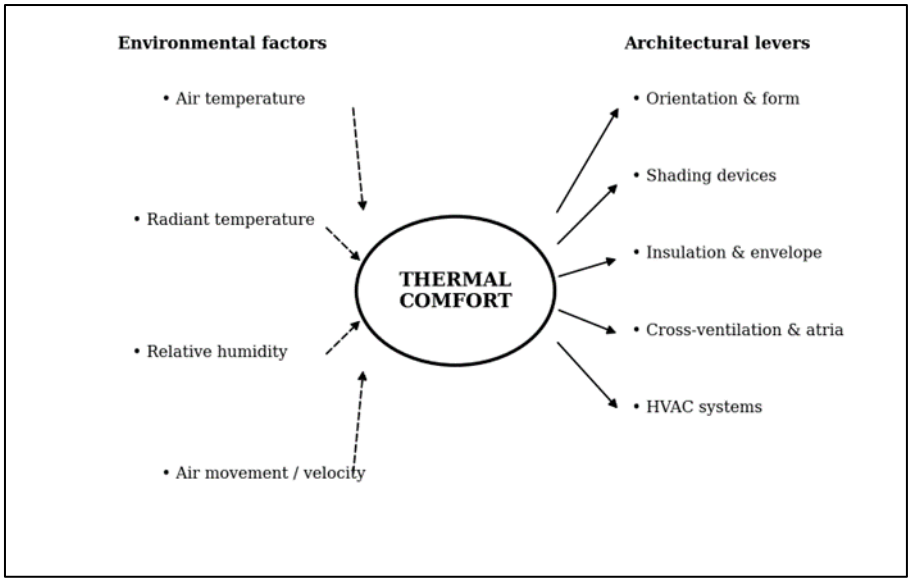


Source: Authors' construction, after Ching (2014).

Figure 1 Progressive public–semi-public–restricted zoning for a naval conference centre

2.1.2. Thermal Comfort and Ventilation

Thermal comfort governs how occupants perceive the indoor environment. Olukanni et al. (2026) note that temperature, humidity, airflow and radiant heat determine comfort, and that architectural features‹ orientation, shading devices, insulation, cross-ventilation paths, atria and HVAC systems‹ are the levers through which designers act on them (Figure 2).

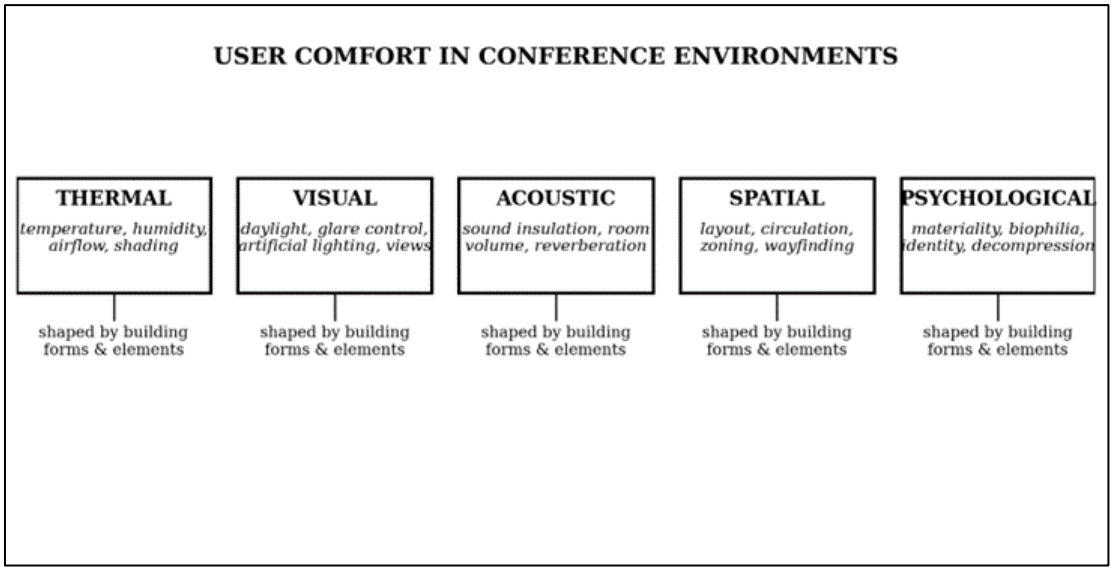


Source: Authors' construction (2026).

Figure 2 Environmental factors of thermal comfort and the architectural levers that act on them

2.1.3. Aesthetics, Materiality and Psychological Comfort

Aesthetic quality influences emotional response and comfort. Warm materials, harmonious colour, natural elements and symbolic form create calming environments that also project institutional identity (Ashoub, 2026). Material choices additionally affect acoustics, illumination and thermal behaviour, making aesthetics both functional and symbolic. Taken together, the five comfort dimensions and their governing forms and elements are summarised in Figure 3 and organised, for the purposes of this study, into the four domains set out in Table 1 and Figure 4.



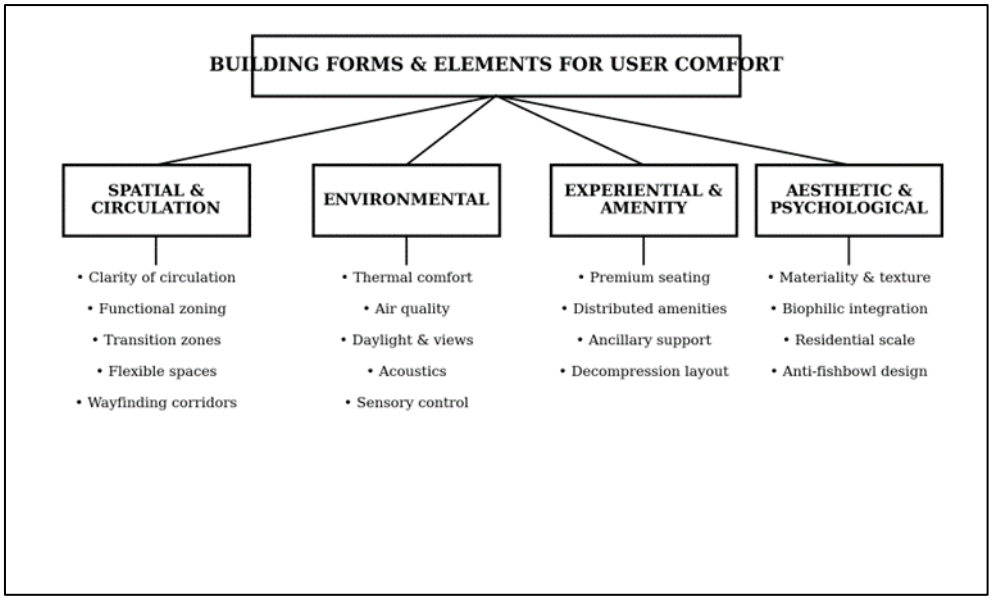
Source: Authors' construction (2026).

Figure 3 The five dimensions of user comfort in conference environments and their architectural determinants

Table 1 A classification of the building forms and elements assessed, by comfort domain

Comfort domain	What it governs	Representative forms & elements assessed
Spatial & circulation	Movement, orientation and functional separation	Clarity of circulation; functional zoning; transition zones; flexible spaces; wide corridors
Environmental	Thermal, air, luminous and acoustic conditions	Thermal comfort; air quality; daylight & views; acoustics; sensory control
Experiential & amenity	Service, ergonomics and the quality of the stay	Premium seating; distributed amenities; ancillary support; decompression layout
Aesthetic & psychological	Identity, calm and sense of place	Materiality & texture; biophilic integration; residential scale; anti-fishbowl design

Source: Authors' construction (2026).



Source: Authors' construction (2026).

Figure 4 The four comfort domains and their representative forms and elements

3. Methodology

The study used a mixed-methods approach combining quantitative survey data with an extensive review of journals, codes and case studies. The study area was Abuja, and the sample comprised naval officers and personnel, administrative staff and facility managers of selected military conference facilities, together with built-environment professionals working within relevant military formations، cadres chosen for their direct insight into the forms and elements that shape comfort in such facilities. The Yamane formula was used to determine the sample size, giving a calculated figure of 180; questionnaires were administered accordingly and 60 were correctly completed and returned, the set on which the analysis is based. Responses were measured on five-point scales and analysed in SPSS using means, standard deviations and rankings, with the scale mid-point of 3.0 used as the reference for knowledge, integration, significance or agreement.

4. Results

4.1. Knowledge of Building Forms and Elements

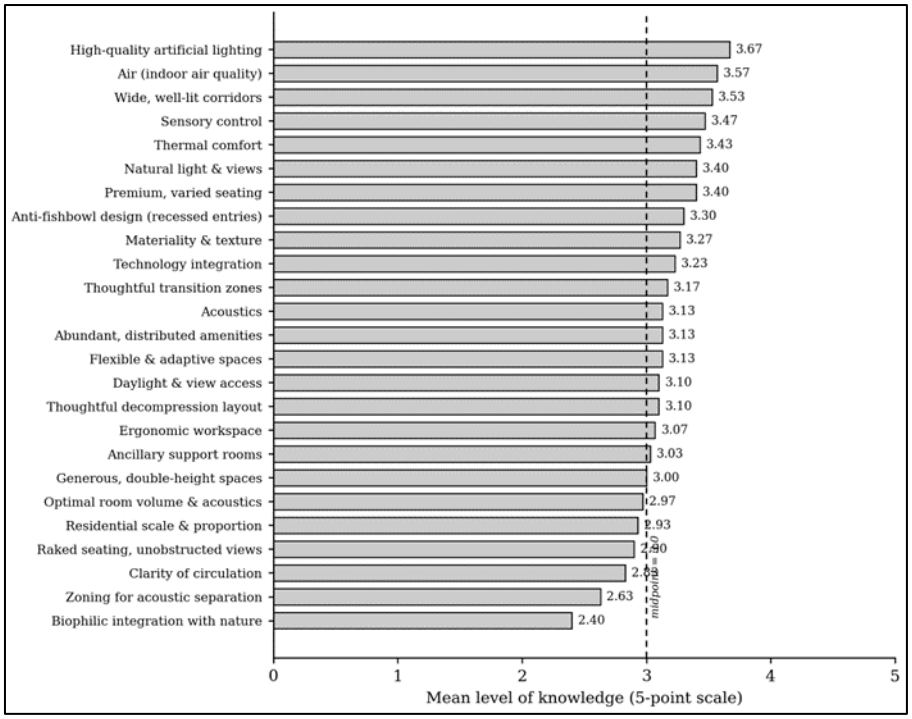
Table 2 and Figure 5 report respondents' knowledge of the 25 forms and elements. High-quality artificial lighting recorded the highest mean (3.67), followed by air / indoor air quality (3.57), wide well-lit corridors (3.53), sensory

control (3.47) and thermal comfort (3.43)، the directly experienced environmental comforts. The least-recognised were biophilic integration with nature (2.40), zoning for acoustic separation (2.63) and clarity of circulation (2.83), indicating that the more abstract spatial and organising strategies are least appreciated by the cadres surveyed.

Table 2 Knowledge of building forms and elements that enhance users' comfort (N = 60)

S/N	Building form / element	Mean	SD	Rank
1	High-quality artificial lighting	3.67	0.95	1st
2	Air (indoor air quality)	3.57	1.10	2nd
3	Wide, well-lit corridors	3.53	1.35	3rd
4	Sensory control	3.47	1.10	4th
5	Thermal comfort	3.43	1.10	5th
6	Premium, varied seating	3.40	1.18	6th
7	Natural light & views	3.40	1.03	6th
8	Anti-fishbowl design (recessed entries)	3.30	1.33	8th
9	Materiality & texture	3.27	1.10	9th
10	Technology integration	3.23	1.03	10th
11	Thoughtful transition zones	3.17	1.14	11th
12	Flexible & adaptive spaces	3.13	1.16	12th
13	Abundant, distributed amenities	3.13	1.54	12th
14	Acoustics	3.13	1.24	12th
15	Thoughtful decompression layout	3.10	1.31	15th
16	Daylight & view access	3.10	0.99	15th
17	Ergonomic workspace	3.07	1.30	17th
18	Ancillary support rooms	3.03	1.15	18th
19	Generous, double-height spaces	3.00	1.04	19th
20	Optimal room volume & acoustics	2.97	1.12	20th
21	Residential scale & proportion	2.93	1.19	21st
22	Raked seating, unobstructed views	2.90	1.05	22nd
23	Clarity of circulation	2.83	1.35	23rd
24	Zoning for acoustic separation	2.63	1.24	24th
25	Biophilic integration with nature	2.40	1.37	25th

Rankings recomputed from the reported means. Source: Authors' analysis, SPSS (2026).



Source: Authors' analysis (2026).

Figure 5 Mean level of knowledge of the 25 forms and elements (dashed line = 3.0 mid-point)

4.2. Level of Integration

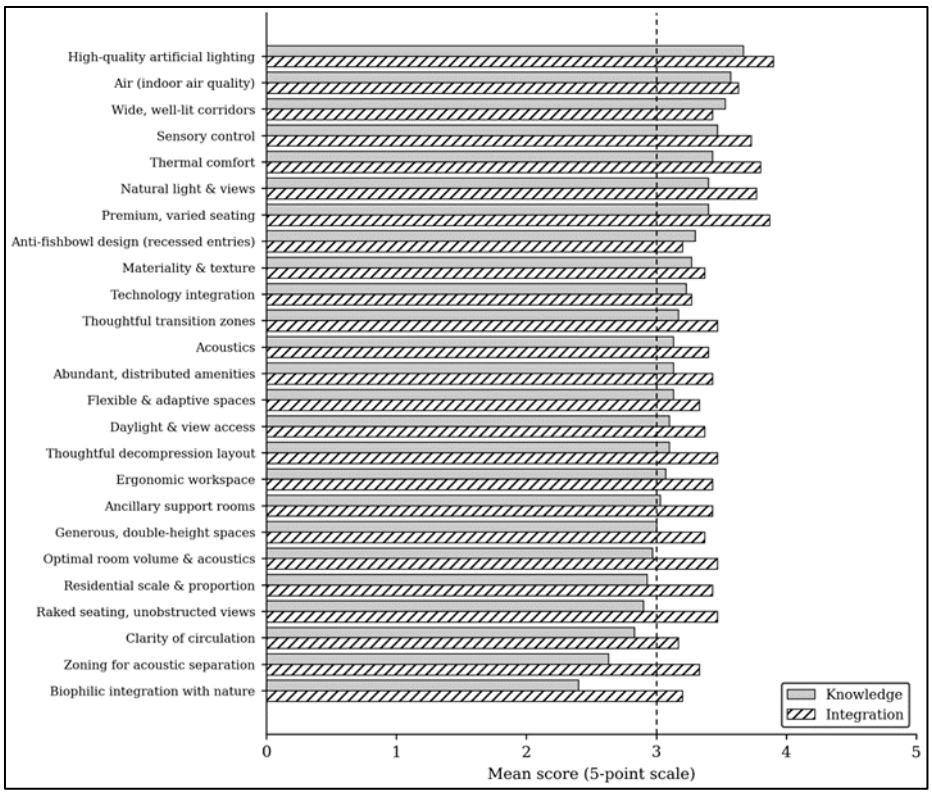
Table 3 reports the perceived integration of the same elements. High-quality artificial lighting again ranked highest (3.90), followed by premium varied seating (3.87), thermal comfort (3.80), natural light and views (3.77) and sensory control (3.73). Figure 6 sets knowledge against integration; notably, reported integration exceeds reported knowledge for most elements‹ an unusual pattern that most likely reflects how the two constructs were phrased and is flagged here for verification. What is consistent across both measures is the primacy of the environmental comforts‹ lighting, air, thermal comfort and sensory control‹ over the more abstract spatial strategies.

Table 3 Level of integration of building forms and elements (N = 60)

S/N	Building form / element	Mean	SD	Rank
1	High-quality artificial lighting	3.90	1.09	1st
2	Premium, varied seating	3.87	1.19	2nd
3	Thermal comfort	3.80	1.02	3rd
4	Natural light & views	3.77	1.35	4th
5	Sensory control	3.73	1.13	5th
6	Air (indoor air quality)	3.63	1.18	6th
7	Raked seating, unobstructed views	3.47	1.03	7th
8	Optimal room volume & acoustics	3.47	0.93	7th
9	Thoughtful transition zones	3.47	0.99	7th
10	Thoughtful decompression layout	3.47	1.16	7th
11	Wide, well-lit corridors	3.43	1.21	11th
12	Abundant, distributed amenities	3.43	1.06	11th
13	Residential scale & proportion	3.43	1.37	11th

14	Ergonomic workspace	3.43	1.24	11th
15	Ancillary support rooms	3.43	1.21	11th
16	Acoustics	3.40	1.24	16th
17	Generous, double-height spaces	3.37	1.24	17th
18	Daylight & view access	3.37	1.06	17th
19	Materiality & texture	3.37	1.24	17th
20	Zoning for acoustic separation	3.33	0.84	20th
21	Flexible & adaptive spaces	3.33	1.12	20th
22	Technology integration	3.27	1.33	22nd
23	Biophilic integration with nature	3.20	1.21	23rd
24	Anti-fishbowl design (recessed entries)	3.20	0.99	23rd
25	Clarity of circulation	3.17	1.36	25th

Rankings recomputed from the reported means. Source: Authors' analysis, SPSS (2026).



Source: Authors' analysis (2026).

Figure 6 Knowledge (solid) versus integration (hatched) for each form and element

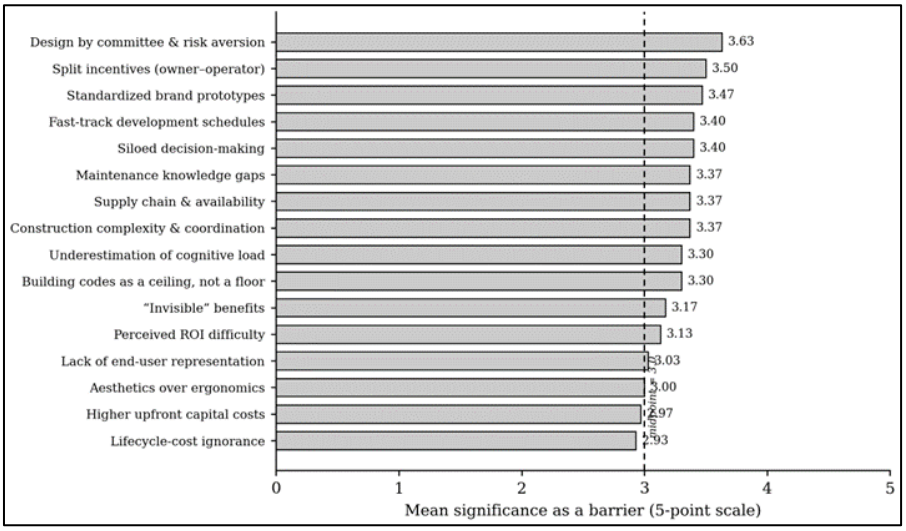
4.3. Barriers that Inhibit Integration

Table 4 and Figure 7 report the 16 barriers to integrating comfort-enhancing forms and elements in conference centres. Design by committee and risk aversion ranked highest (3.63), followed by split incentives / the owner–operator problem (3.50), standardised brand prototypes (3.47), and siloed decision-making and fast-track development schedules (both 3.40). The lowest were life-cycle-cost ignorance (2.93), higher upfront capital costs (2.97) and the prioritisation of aesthetics over ergonomics (3.00). The leading barriers are organisational and procedural rather than financial‹ the way projects are decided and delivered, more than their cost.

Table 4 Barriers that inhibit the integration of building forms and elements (N = 60)

S/N	Barrier	Mean	SD	Rank
1	Design by committee & risk aversion	3.63	1.15	1st
2	Split incentives (owner–operator)	3.50	0.85	2nd
3	Standardized brand prototypes	3.47	0.97	3rd
4	Siloed decision-making	3.40	0.81	4th
5	Fast-track development schedules	3.40	0.99	4th
6	Construction complexity & coordination	3.37	1.18	6th
7	Supply chain & availability	3.37	1.15	6th
8	Maintenance & operational knowledge gaps	3.37	1.26	6th
9	Building codes as a ceiling, not a floor	3.30	0.69	9th
10	Underestimation of cognitive load	3.30	1.08	9th
11	“Invisible” benefits	3.17	1.28	11th
12	Perceived ROI difficulty	3.13	0.97	12th
13	Lack of end-user representation in briefing	3.03	1.09	13th
14	Prioritization of aesthetics over ergonomics	3.00	1.01	14th
15	Higher upfront capital costs	2.97	0.92	15th
16	Lifecycle-cost ignorance	2.93	0.89	16th

Rankings recomputed from the reported means. Source: Authors' analysis, SPSS (2026).



Source: Authors' analysis (2026).

Figure 7 Mean significance of the 16 barriers (dashed line = 3.0 mid-point)

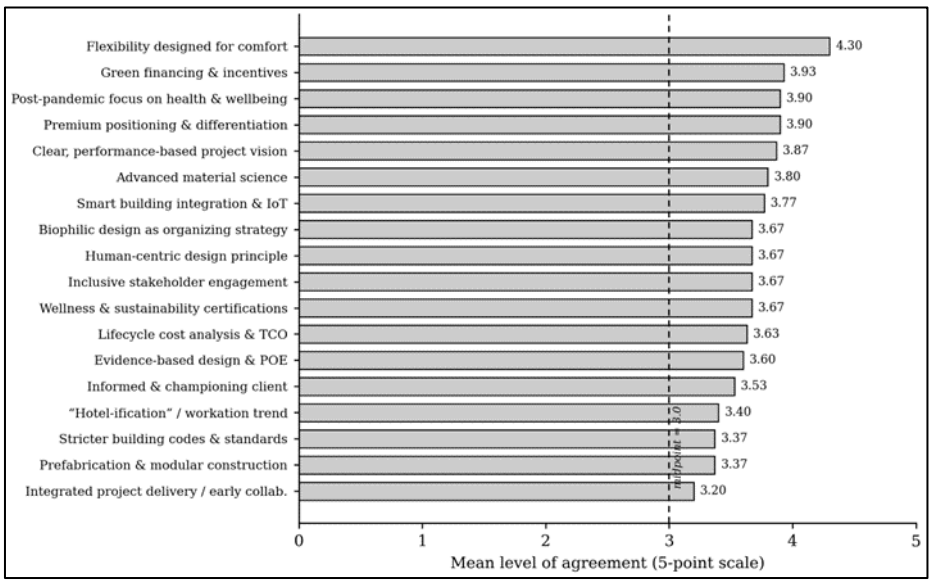
4.4. Success Factors that Enhance Integration

Table 5 and Figure 8 report the 18 success factors. Flexibility designed for comfort, not just capacity, ranked highest by a clear margin (4.30), followed by green financing and incentives (3.93), premium positioning and market differentiation and a post-pandemic focus on health and wellbeing (both 3.90), and a clear, performance-based project vision (3.87). The lowest were integrated project delivery / early collaboration (3.20), prefabrication and modular construction and stricter building codes (both 3.37). Table 6 draws the four objectives together.

Table 5 Success factors that enhance the integration of building forms and elements (N = 60)

S/N	Success factor	Mean	SD	Rank
1	Flexibility designed for comfort, not just capacity	4.30	0.59	1st
2	Green financing & incentives	3.93	0.69	2nd
3	Premium positioning & market differentiation	3.90	0.92	3rd
4	Post-pandemic focus on health & wellbeing	3.90	0.79	3rd
5	Clear, performance-based project vision	3.87	0.89	5th
6	Advanced material science	3.80	0.84	6th
7	Smart building integration & IoT	3.77	0.77	7th
8	Adoption of wellness & sustainability certifications	3.67	0.99	8th
9	Inclusive stakeholder engagement	3.67	0.99	8th
10	Human-centric design as a core principle	3.67	0.79	8th
11	Biophilic design as an organizing strategy	3.67	0.66	8th
12	Lifecycle cost analysis (LCA) & TCO	3.63	0.96	12th
13	Evidence-based design & post-occupancy evaluation	3.60	1.15	13th
14	An informed & championing client	3.53	1.03	14th
15	The “hotel-ification” / “workation” trend	3.40	0.76	15th
16	Prefabrication & modular construction	3.37	0.96	16th
17	Stricter building codes & standards	3.37	1.09	16th
18	Integrated project delivery / early collaboration	3.20	1.26	18th

Rankings recomputed from the reported means. Source: Authors' analysis, SPSS (2026).



Source: Authors' analysis (2026).

Figure 8 Mean level of agreement on the 18 success factors (dashed line = 3.0 mid-point)

Table 6 Summary of the leading finding for each research objective

Research objective	Leading item	Mean	Key inference
Knowledge of forms & elements	High-quality artificial lighting	3.67	Awareness centres on visible environmental comforts
Extent of integration	High-quality artificial lighting	3.90	Environmental comforts are also the most applied
Barriers to integration	Design by committee & risk aversion	3.63	Process and organisational factors dominate, not cost
Success factors	Flexibility designed for comfort	4.30	Comfort-led flexibility is the strongest enabler

Source: Authors' analysis (2026).

5. Discussion

The findings show that building forms and architectural elements play a significant role in enhancing users' comfort within conference and hospitality facilities. Respondents most readily recognised and reported the directly experienced environmental comforts‹ high-quality lighting, air quality, thermal comfort and sensory control‹ while the more abstract spatial and organising strategies, such as biophilic integration, acoustic zoning and clarity of circulation, were least appreciated, even though these strongly shape how a large, multifunctional facility actually performs. This suggests that raising awareness of spatial and psychological comfort, not only environmental comfort, is an important design and educational task.

The barrier analysis is equally telling: the leading obstacles‹ design by committee and risk aversion, split incentives, standardised prototypes and siloed decision-making‹ are organisational and procedural rather than financial, with upfront cost ranking near the bottom. Improving comfort integration in naval and institutional facilities is therefore less a matter of budget than of decision-making structure, end-user representation and delivery process. That comfort-led flexibility ranked as the strongest enabler reinforces the point: respondents see adaptable, comfort-driven space‹ rather than mere capacity‹ as the key to facilities that serve their users well. Careful integration of climate-responsive forms, efficient spatial organisation, appropriate orientation, natural lighting, ventilation, shading and functional circulation thus contributes materially to thermal, visual, acoustic and psychological comfort, improving not only satisfaction but operational efficiency and long-term sustainability.

6. Conclusion

The study concludes that users' comfort should be treated as a fundamental design objective in the planning of Naval Conference Centres and Suites, and that the integration of climate-responsive forms and elements improves occupant comfort, building performance and long-term sustainability. On the basis of the findings, the following recommendations are made:

- Building forms should be designed to respond to Abuja's climate so as to improve thermal comfort and reduce dependence on mechanical cooling;
- Architects should integrate passive strategies‹ proper orientation, natural ventilation, shading, landscaping and daylighting‹ in conference and hospitality facilities;
- Functional zoning and efficient circulation should be prioritised to improve accessibility, convenience and user experience across conferencing and accommodation; and
- Government agencies, military institutions and private developers should adopt sustainable, climate-responsive design principles in future conference and hospitality projects.

This research contributes by documenting how building forms and elements enhance users' comfort in conference and hospitality facilities, identifying strategies that improve thermal, visual, acoustic and functional comfort, and demonstrating the relationship between building form, environmental responsiveness and comfort in the Nigerian context. Further study is suggested on the comparative evaluation of comfort in conference centres across Nigeria's climatic zones, post-occupancy evaluation of such facilities, and the integration of smart building technologies with sustainable design for improved comfort.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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