



Designing for The Senses: A Sense–Space Planning Framework for Human-Centred Hospitality Interiors: Integrating Spatial Configuration, Sensory Conditions, and Materiality in Interior Architecture

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ABSTRACT

Hospitality interiors are not experienced through the eyes alone. The way a hotel lobby, restaurant, lounge, or reception area feels depends on how its space, light, sound, materials, temperature, and movement work together. Yet in much of practice these sensory decisions are made one at a time, as separate aesthetic choices, rather than planned together from the start. This paper develops and proposes a design-based evaluation of a Sense–Space Planning Framework for human-centred hospitality interiors. The framework draws on four established ideas: Bitner's (1992) servicescape model, Spence's (2020, 2022) work on the multisensory and crossmodal nature of architectural experience, Mehrabian and Russell's (1974) environmental-psychology model of emotional response, and recent evidence on lighting, acoustics, biophilic design, and wayfinding in hospitality settings. The framework treats sensory experience as an interaction between the environment, the user's expectations, the activity, and the context, rather than as a fixed reaction to any single feature. It is organised into five stages spatial structure, sensory conditions, materiality, sensory sequence, and sensory evaluation each with clear planning questions and evaluation criteria. A design-based research method is proposed, combining literature review, comparative case studies, sensory and spatial mapping, iterative design development, expert review, and user evaluation. The central proposition is that coordinating sensory and spatial decisions explicitly offers a more systematic way to plan and judge hospitality interiors than a process focused mainly on function and appearance. Because the evidence base is still mixed (Bower et al., 2019), the framework's value must be shown through application and testing, not assumed.

Introduction

Interior architecture is the art and science of organising space, circulation, furniture, lighting, materials, environmental conditions, and human activity inside an enclosed environment. In hospitality design these responsibilities are tightly linked, because an interior must both support daily operations and communicate the identity and intended experience of a hotel, restaurant, café, or lounge. A space that works on paper can still fail in use if it feels confusing, noisy, exposed, or cold.

A hotel lobby is a good example. It must provide a clear arrival sequence, a reception point, waiting facilities, circulation, and access to nearby spaces. But how it actually feels depends on the relationship between entrance visibility, lighting contrast, acoustics, surface materials, seating, proportions, and the movement of guests and staff. A technically efficient lobby may still feel unwelcoming if these elements pull against one another.

Bitner's (1992) servicescape model established that the physical surroundings of a service shape how customers and employees feel and behave. It identifies three main dimensions: ambient conditions, spatial layout and functionality, and signs, symbols, and

artefacts. This gives a strong foundation, but it mainly explains which factors matter; it does not, on its own, tell a designer how to coordinate them from the earliest planning stages. Research on multisensory architecture adds another layer. Spence (2020) shows that people do not experience a building through vision alone but through several senses that influence one another, an effect known as crossmodal perception. In hospitality specifically, Spence (2022) argues that guest experience can be “sensehacked” by designing sound, scent, light, and touch together rather than separately.

These perspectives point to a shift: from a planning process led mainly by function toward one that also considers, in a structured way, how people perceive, move through, and use a space. Function remains essential. The aim is to join it with a clear method for handling sensory experience. The problem is not that hospitality design ignores the senses; it is that sensory decisions are often judged in separate silos lighting for mood, circulation for efficiency, materials for looks and durability without a shared framework for how the whole combination is experienced. A reflective surface may look elegant but create acoustic glare; a dramatic lighting change may set a mood but harm wayfinding; an open layout may improve visibility but reduce privacy and raise perceived noise.

This paper responds by developing a Sense-Space Planning Framework for hospitality interiors and proposing how it could be evaluated through design-based research. The aim is to develop and design-based evaluate a human-centred framework that integrates spatial configuration, environmental stimuli, material qualities, and sensory sequencing. The objectives are: (1) to review the literature on servicescapes, environmental psychology, multisensory architecture, and spatial experience; (2) to identify recurring sensory and spatial planning considerations in hospitality case studies; (3) to connect design characteristics with perceived sensory coherence and spatial experience; (4) to build and refine a practical framework; (5) to compare function-led and sensory-integrated design alternatives; and (6) to propose design recommendations and evaluation criteria for hospitality interior architecture.

The study carries three kinds of significance. Its theoretical significance is that it brings servicescape theory, environmental psychology, and multisensory perception together to examine how sensory and spatial dimensions can be understood within one planning approach, without assuming the theories are interchangeable. Its design significance is that the framework helps interior architects consider sensory performance early during concept, zoning, circulation, material, and lighting decisions, and in the transitions between zones and gives a structured basis for design reviews. Its contextual significance is that hospitality environments differ in culture, climate, operation, user groups, and service expectations, so a framework that treats these factors openly is likely to be more adaptable than a fixed rule such as “always use warm light for a welcoming space.”

Literature Review and Conceptual Background

Servicescape Theory

Bitner (1992) introduced the servicescape to explain why a service environment is more than a container for transactions. Its three dimensions ambient conditions (such as temperature, light, and sound), spatial layout and functionality, and signs, symbols, and artefacts help explain how customers and staff read and act within a setting. In a hotel, the reception desk, seating, lighting, acoustics, routes, signage, and décor together set the stage on which guests arrive, wait, ask for help, and move on. In a restaurant, table spacing, sightlines, acoustics, and the link between dining and service routes shape how the space is used. However, the servicescape is an explanatory model, not a step-by-step planning method. It names the factors but does not fully specify how a designer should coordinate them while developing a floor plan. The present study proposes mapping servicescape dimensions against spatial relationships, intended activities, sensory transitions, and user evaluations an extension of the model toward design practice.

Multisensory Perception and Architectural Experience

Spence (2020) reviews the multisensory nature of architectural experience and argues for designing with the senses together rather than in isolation. Through crossmodal effects, information from one sense can change how another is interpreted. For hospitality interiors this is directly relevant: a guest does not read light, texture, sound, proportion, and movement as separate variables. A polished stone surface may signal visual refinement while also reflecting sound, creating glare, or feeling cold to the touch. A dimly lit corridor may set a mood while making it harder to find doors or changes in level. In a hospitality-specific review, Spence (2022) describes how hotels can deliberately coordinate scent, sound, lighting, and tactile cues to shape the guest experience. These are design questions, not fixed rules: the same cue can suit one activity and unsettle another, so sensory experience depends on the intensity, combination, and interpretation of cues as well as the purpose of the space.

Crossmodal thinking also helps explain some common hospitality problems. Guests often say a restaurant is “too loud” even when measured sound levels are moderate, because hard, reflective surfaces that look sleek also bounce sound and raise the sense of noise. A lobby may feel cold not because of its temperature but because of blue-toned light and smooth stone, while the same plan with warm light and textured timber feels warmer without any change to the thermostat. These examples show that a sensory judgement is rarely about one sense alone, which is exactly why the framework asks designers to test combinations rather than single features.

Environmental Psychology and Emotional Response

Mehrabian and Russell’s (1974) model describes emotional response to environments along three dimensions: pleasure, arousal, and dominance. These ideas have shaped later research on how designed settings make people feel. In hospitality, a lobby, restaurant, lounge, or guest room may be felt as pleasant but over-stimulating, attractive but hard to navigate, or spacious but not intimate enough for its purpose. This shows why a single satisfaction score cannot capture the full experience of an interior. Importantly, emotional response is not a direct and predictable output of one design feature; the same level of enclosure, light, or sound can be read differently depending on the user, activity, expectations, and context. A systematic review by Bower et al. (2019) which examined built-environment design and emotion using both physiological and subjective measures found a limited set of eligible studies and wide variation in methods. This supports using clear, consistent evaluation measures and cautions against claiming that any sensory intervention automatically improves wellbeing.

Spatial Configuration, Movement, and Legibility

Spatial configuration concerns how spaces are organised and related: connectivity, enclosure, visibility, circulation, thresholds, and the position of functional zones. These features decide what a user can see and where they can go while navigating. In a lobby, configuration determines whether a new guest can quickly find reception, seating, lifts, and onward routes; in a restaurant, the links between entrance, dining, service routes, and private seating affect both experience and efficiency. Research on wayfinding confirms that clear spatial information and legible layouts improve how efficiently and confidently people move through complex environments (Iftikhar & Luximon, 2023). Sensory planning, therefore, cannot be reduced to choosing colours, textures, or fixtures: the geometry and sequence of spaces are part of the experience itself. A fine material palette cannot rescue a confusing arrival route, and a clear plan cannot by itself guarantee acoustic comfort.

Lighting, Acoustics, and Materiality

Lighting affects visibility, contrast, visual hierarchy, and how surfaces and boundaries are read. Daylight varies over time, while artificial light gives more control across activities and operating hours, but its quality depends on glare, contrast, colour appearance, and the needs of the task. In restaurants, lighting design even shapes whether people choose to enter: focal and general lighting schemes influence customers’ approach intentions (Wu et al., 2021). Acoustic conditions depend on far more than whether a room is “quiet” or “lively.” Reverberation, background noise, sound transmission, speech clarity, occupancy, and the placement of sound sources all matter, and acoustic comfort in eating places is best understood as a combination of these factors rather than a single number (Mistar et al., 2020). A restaurant built for lively interaction needs different acoustics from a reception where guests must understand staff. Materiality has both perceptual and technical sides texture, reflectance, colour, tactile character, durability, cleanability, and acoustic behaviour and in hospitality it also carries operational demands such as maintenance, hygiene, fire safety, accessibility, and heavy use.

Biophilic and Restorative Approaches

A growing body of work looks at how contact with nature inside buildings supports comfort and wellbeing. Biophilic design using natural light, planting, natural materials, views, and natural patterns has been linked to more restorative and positive hospitality environments (Guzzo et al., 2022). For the present framework, biophilic elements are treated not as a guaranteed cure but as one set of sensory and material options whose value depends on context, activity, and operation. They show clearly why sensory decisions and spatial decisions must be planned together: a planted courtyard changes light, sound, humidity, maintenance, and circulation all at once.

Research Gap and Critical Synthesis

Together these sources provide strong foundations but leave clear gaps, summarised in Tables 1 and 2. Servicescape theory explains the importance of physical surroundings (Bitner, 1992); multisensory research stresses interaction between the senses (Spence,

2020, 2022); environmental psychology offers ways to describe emotional response (Mehrabian & Russell, 1974); and the review by Bower et al. (2019) warns that the evidence linking design and measured emotion is still limited and varied. Four gaps follow. First, a design-translation gap: theories identify relationships but designers still need an operational method across planning stages. Second, an integration gap: layout, lighting, acoustics, and materiality are usually judged by separate criteria, whereas the experience is their combination. Third, an evaluation gap: because the evidence is mixed, a framework needs explicit criteria and an honest account of what its methods can and cannot show. Fourth, a context gap: hospitality interiors differ in activity, culture, climate, accessibility, and operation, so a framework must be tested in a defined context rather than assumed to work everywhere.

Table 1.;Theories and evidence feeding the Sense–Space Planning Framework.

Source	Main idea	What it contributes to the framework
Bitner (1992)	Servicescape: physical surroundings shape service behaviour	Names the environmental dimensions to plan: ambient, spatial, and symbolic
Spence (2020, 2022)	Architecture is multisensory and crossmodal	Reason to coordinate light, sound, touch, and scent together, not separately
Mehrabian & Russell (1974)	Emotional response as pleasure, arousal, dominance	A vocabulary for describing how a space feels, beyond “liked / disliked”
Bower et al. (2019)	Evidence on design and emotion is limited and mixed	Caution: use clear measures; do not assume benefits
Wu et al. (2021); Mistar et al. (2020)	Lighting and acoustics strongly shape hospitality experience	Concrete sensory variables and criteria for evaluation
Guzzo et al. (2022)	Biophilic design supports restorative experience	Nature-based options whose effect depends on context

Table 2;Four research gaps and the framework’s response.

No.	Gap	What the framework must do about it
1	Design-translation gap	Turn theory into an operational, stage-by-stage planning method
2	Integration gap	Judge the combined sensory experience, not each element alone
3	Evaluation gap	Use explicit criteria and state honestly what the method can prove
4	Context gap	Test the framework in a defined setting, not as a universal formula

The Sense–Space Planning Framework

The proposed framework organises sensory and spatial decisions into five connected stages. The stages are not a rigid sequence to follow once; they are meant to be revisited in iterative design cycles, so that a change in one stage (for example, a new material) is checked against the others (its effect on sound, light, and cleaning). Table 3 sets out the five stages and the main question each one asks.

Table 3;The five stages of the Sense–Space Planning Framework.

Stage	Focus	Main planning question
1. Spatial structure	Layout, connectivity, visibility, circulation, thresholds	Can users understand the space and move through it easily?
2. Sensory conditions	Light, sound, temperature, air, and their levels	Are the ambient conditions right for each activity?
3. Materiality	Surfaces: look, touch, acoustics, durability, hygiene	Are finishes suitable in both sensory and technical terms?
4. Sensory sequence	How experience changes from zone to zone	Do transitions feel coherent and support orientation?
5. Sensory evaluation	Comparing alternatives against shared criteria	Does the design communicate its intention to users?

The logic of the five stages runs from the general to the particular and then back to a check. Spatial structure comes first because the arrangement of spaces sets the limits within which every other decision is made; a confusing plan cannot be fixed by finishes later. Sensory conditions come next, tuning light, sound, temperature, and air to the activities each zone must hold. Materiality follows, because surfaces carry much of both the look and the technical behaviour of a space, affecting sound, glare, touch, and upkeep at once. The sensory sequence stage then steps back to look across zones, asking whether the journey from one space to the next feels coherent and aids orientation. Finally, sensory evaluation closes the loop by comparing alternatives against shared criteria, which is what allows the process to be iterative rather than a single pass.

Each stage carries its own design dimensions and evaluation criteria. Table 4 expands the framework into a working matrix that a designer or review panel can use to check a proposal. The criteria are written as things that can be observed or rated, so that design decisions can be documented and compared rather than described only as “calm” or “welcoming.”

Table 4; Proposed sensory design and evaluation matrix.

Design dimension	Planning question	Evaluation criterion
Spatial structure	Can users identify destinations and move through the space?	Wayfinding clarity and circulation logic
Lighting	Does lighting support the activities and transitions?	Perceived visual comfort and visibility
Acoustics	Are acoustic conditions appropriate to the intended use?	Perceived acoustic comfort and speech clarity
Materiality	Are finishes appropriate in sensory and technical terms?	Perceived material suitability and technical feasibility
Sensory sequence	Do adjoining zones feel appropriately connected?	Perceived coherence and transition quality
Human-centred performance	Does the proposal suit diverse users and operations?	Accessibility, usability, and task suitability

Research Methodology

Three features of the framework deserve emphasis. First, it is built around coordination rather than prescription: it does not tell the designer to use a fixed material or light level, but asks whether the chosen combination suits the activity, user, and context. Second, it keeps a clear line between physical design characteristics (what is built) and perceived responses (how users read it), because the same feature can be experienced differently by different people. Third, it treats function and accessibility as constants, not optional extras: a sensory improvement that harms operation, hygiene, or access is not an improvement. In this way the framework is intended to widen the design conversation without pushing aside the practical demands that hospitality interiors must always meet.

The study proposes a design-based research (DBR) approach. DBR is suitable because the intended output is not only an explanation of spatial experience but also a design artefact the planning framework that is developed, evaluated, and refined through repeated cycles. The research combines qualitative interpretation with structured comparative evaluation. The qualitative part supports analysis of case studies, expert feedback, user comments, and design decisions. The comparative part uses predefined rating criteria to examine how participants respond to alternative design proposals. The study does not assume that a framework is valid simply because it has been produced; its worth is judged by its clarity, practical use, ability to structure decisions, and the quality of evidence gathered. Table 5 summarises the phases and methods.

Table 5; Design-based research phases and methods.

No.	Phase	Method	Purpose
1	Literature review	Critical review of servicescape, multisensory, and environmental-psychology research	Build the conceptual basis and identify gaps
2	Case studies	Comparative study of selected hospitality interiors	Find recurring sensory and spatial planning considerations
3	Mapping	Sensory and spatial mapping of case and design material	Connect design features to perceived experience

4	Design development	Iterative function-led and sensory-integrated alternatives	Test the framework in practice
5	Evaluation	Expert review and user rating against shared criteria	Judge coherence, comfort, and usability

Data Analysis

Qualitative data from expert reviews, open-ended responses, and design reflections will be analysed thematically. Likely early codes include circulation clarity, sensory compatibility, perceived comfort, material suitability, acoustic concerns, accessibility, operational performance, and context dependence. Themes should come from the data, not be imposed to confirm the framework. Where numerical ratings are collected, they will be summarised with descriptive statistics and suitable comparisons between alternatives; inferential tests will be used only when the sample and design allow. The study will triangulate across literature, case studies, expert evaluation, and user responses. Agreement across sources strengthens a recommendation, while disagreement is kept as meaningful evidence of contextual variation (Bower et al., 2019).

Applying the Framework to a Hotel Lobby

To show how the framework works in practice, consider a hypothetical hotel lobby with an entrance, reception desk, waiting area, lift access, and a route to the restaurant. The example is illustrative; it is not the result of a completed experiment. At the spatial-structure stage, the designer sets the main arrival route and the visual links between entrance, reception, seating, and onward circulation, so that a new guest can orient quickly (Iftikhar & Luximon, 2023). At the sensory-conditions stage, the designer checks glare, daylight variation, background noise, speech clarity, and the needs of each lobby activity (Wu et al., 2021; Mistar et al., 2020). At the materiality stage, surfaces are assessed for appearance and for cleanability, durability, acoustic behaviour, and guest contact. The sensory-sequence stage looks at how the move from entrance to reception to waiting is experienced, including whether light and material changes aid orientation without creating barriers. Finally, the sensory-evaluation stage compares alternatives against the shared criteria in Table 4. Table 6 shows the stage-by-stage logic for the lobby.

Table 6; Stage-by-stage application of the framework to a hotel lobby.

Stage	What the designer examines	Example evaluation question
Spatial structure	Arrival route and sightlines to reception, seating, lifts	Is reception easy to find on entering?
Sensory conditions	Glare, daylight, background noise, speech clarity	Can guests hear staff clearly at the desk?
Materiality	Surface look, touch, acoustics, cleanability	Do finishes suit heavy guest contact and sound control?
Sensory sequence	Transition from entrance to reception to waiting	Does the lighting change aid orientation, not confuse it?
Sensory evaluation	Comparison of design alternatives	Is the atmosphere coherent with the intended service?

Expected Contributions and Interpretation

The framework's intended theoretical contribution is to show how servicescape theory, environmental psychology, and multisensory perception can jointly inform a structured design process. It does not replace these theories; it connects their concepts to the practical stages of interior planning and gives a transparent path from principles to case analysis, design development, evaluation, and revision. The contribution is strongest when the research records not only positive results but also disagreements, trade-offs, and cases where sensory aims conflict with operational needs.

The practical contribution is a checklist that helps interior architects weigh sensory issues before detailed design: acoustic implications during zoning, visibility during circulation planning, and maintenance before a finish palette is fixed. It also supports design reviews by making sensory intentions explicit. Instead of calling a lobby simply "calm," a designer can state the intended arrival sequence, acoustic strategy, lighting hierarchy, and seating relationships, then test whether users read that intention.

The framework may also improve communication across the project team. Hospitality projects involve owners, operators, brand managers, lighting and acoustic consultants, and maintenance staff, who often describe the same space in different words. By

naming shared sensory dimensions and criteria, the framework gives these groups a common language, so that an acoustic concern raised by an operator and a mood goal set by a brand manager can be weighed on the same table rather than in separate conversations. This is a modest but useful benefit: better-documented decisions are easier to revisit when a design must change late in a project.

Interpretation must stay careful. If the sensory-integrated alternative scores higher on coherence and spatial experience, that would give preliminary support for coordinating sensory variables within the tested context not proof that the framework works for every hospitality type. If alternatives score similarly, it may mean the sensory strategy made no perceptible difference, that the function-led design already contained good sensory decisions, or that the evaluation method was not sensitive enough. This honest reading reflects the mixed evidence base reported by Bower et al. (2019).

It is worth stating what the framework is not. It is not a promise that following five stages will produce a beautiful or profitable interior, and it is not a substitute for the designer's skill, the operator's knowledge, or the technical input of lighting and acoustic specialists. Its purpose is narrower and more realistic: to make sensory and spatial decisions visible, ordered, and testable, so that the reasons behind a design can be examined and improved. A framework that makes thinking explicit is valuable even when it does not change the final answer, because it shows why that answer was reached and makes it easier to defend or revise.

Limitations and Future Research

Several limitations apply. First, the framework is provisional: its stages and dimensions are drawn from the literature and must be refined through expert and user evaluation, and its name does not by itself establish originality or validity. Second, design representations have limits: plans and renderings can show organisation and visual atmosphere but cannot fully reproduce the acoustic, tactile, thermal, or embodied experience of a built space, so conclusions from images alone must stay modest. Third, case-study access is uneven: some interiors have detailed plans and measured environmental data, while others offer only photographs, so measured conditions must be kept separate from visual inference. Fourth, context affects transfer: a framework shaped for one hotel lobby may not behave the same way in a restaurant, resort, café, or healthcare-related setting, because culture, climate, accessibility, budget, and service model all vary. Fifth, sample size affects strength: a small group of professionals or users can reveal usability problems and refine the framework but cannot support broad generalisation or robust statistical analysis. Future research should test the framework across several hospitality types, use immersive or in-situ methods where possible, and build larger and more diverse participant samples.

Conclusion

This paper proposes a shift from treating sensory considerations as isolated aesthetic choices toward integrating them within the early planning of hospitality interiors. Drawing on servicescape theory (Bitner, 1992), multisensory perception (Spence, 2020, 2022), and environmental psychology (Mehrabian & Russell, 1974), and supported by recent evidence on lighting, acoustics, biophilic design, and wayfinding, it develops a Sense-Space Planning Framework with five stages: spatial structure, sensory conditions, materiality, sensory sequence, and sensory evaluation. A design-based research process combining literature review, case studies, mapping, iterative design, and evaluation is proposed to develop and refine it.

The central question is whether explicitly coordinating sensory and spatial decisions gives a more systematic and useful way to design hospitality environments than a process that leaves such coordination implicit. The framework's value must be shown through application, evaluation, and revision; it is not a universal formula for comfort or positive emotion. Its real contribution is a transparent method for relating design decisions to user perceptions while protecting functional, technical, operational, and accessibility requirements. In the end, the research seeks to help hospitality interiors be planned not only as spaces that hold activities, but as environments whose sensory qualities are deliberately coordinated and critically evaluated in relation to the people who use them.

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