

Preserving Meanings, Memories, and Emotional Attachments in Vernacular Settings: Employing Neuroscience to Gain Insights from the Traditional Houses in Bahrain

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Abstract

Rapid urban transformation in Bahrain has led to the gradual erasure of a built vocabulary that once anchored collective identity: the courtyards (hoosh), the wind towers (Badageer), coral stone walls, and the sensory sequences that structured daily life across generations. In this context, this research investigates how traditional Bahraini courtyard houses interact with neurological and cultural processes of memory formation, and what is lost cognitively and culturally when these environments are demolished or replaced. Drawing on neuroarchitecture, phenomenology, and cultural memory theory, this study argues that traditional Bahraini houses function as neurologically rich mnemonic environments whose spatial and sensory qualities actively support the formation and transmission of memory in ways that contemporary standardized houses do not.

It employs a qualitative case study methodology, combining semi-structured interviews with twelve participants, direct spatial observations at two sites, and archival analysis using materials from the Bahrain Authority for Culture and Antiquities and publicly available digital sources. Interviews revealed unanimous identification of the courtyard as the primary site of spatial memory. Spatial observations demonstrated the immediacy of embodied recall upon re-entering traditional spatial sequences. Archival data unearthed a pattern of incremental material erosion preceding physical demolition.

Findings confirm that emotional attachments form through repeated sensory inhabitation over time, and that the courtyard typology uniquely supports collective and transmissible memories across generations in ways that no individual modern house can replicate. The research concludes that preserving traditional Bahraini architecture is not merely an aesthetic or heritage concern, but a neurological and cultural necessity: to lose these environments is to erode the sensory and spatial infrastructure through which collective identity and belonging are formed and sustained.

Keywords: Architectural memory, Neuroarchitecture, Traditional Bahraini houses, Courtyard, Collective identity.

Introduction

Architecture is more than shelter; it is an environment that shapes how people think, feel, and remember. Buildings and spaces are not only physical structures, but environments continuously perceived and interpreted by the human brain. As people move through and inhabit spaces, they associate them with experiences, emotions, and events, forming memories that influence how they understand themselves and relate to their surroundings. Because human experience is inherently spatial and temporal, memory is closely connected to the environments in which life unfolds. Consequently, the relationship between architecture, memory, and identity has become an increasingly important area of research, particularly in societies experiencing rapid urban transformation.

In Bahrain, this issue carries urgency. Since the discovery of oil, rapid urban development has transformed the built environment, with many traditional neighborhoods and houses being replaced by contemporary developments influenced by international architectural styles (Alfadhel and Elghonaimy, 2025). Traditional Bahraini houses in Manama and Muharraq were organized around distinctive spatial elements, including the internal courtyard (hoosh), wind tower (badageer), and coral stone walls, which structured daily life and became deeply embedded within cultural memory and social practice (Yarwood and El-Masri, 2005). As these environments disappear, the sensory and spatial vocabulary through which generations of Bahrainis formed attachment to place, belonging, and identity is increasingly at risk of erasure.

Research into the relationship between architecture and memory has expanded considerably in recent years through the fields of neuroarchitecture, phenomenology, and cultural memory studies. However, limited research has examined how these ideas apply within the specific context of traditional Bahraini houses. This research therefore investigates how the spatial qualities of traditional Bahraini houses interact with neurological and cultural processes of memory formation, and what is lost, both cognitively and culturally, when these environments disappear. By examining this relationship, the study seeks to contribute to current knowledge regarding the role of traditional architecture in sustaining memory, emotional attachment, and collective identity.

Its aim is to understand how the spatial qualities of traditional Bahraini houses contribute to memory formation, emotional attachment, and cultural identity through neurological and cultural processes.

Objectives:

- To determine the neurological factors associated with memory formation in architectural environments.
- To identify the spatial elements of traditional Bahraini houses that contribute to memory, emotional attachment, and cultural identity.
- To assess the impact of the loss of traditional architectural environments on collective memory and cultural identity in Bahrain.
- To develop evidence-based recommendations for integrating neuroscientific knowledge into culturally responsive architectural design.

Theoretical Framework

The theoretical foundation of this research rests on three interconnected concepts: neuroarchitecture memory, phenomenology and the senses, and cultural memory and the spirit of place. Together they provide an integrated framework for understanding how traditional Bahraini houses function as mnemonic environments at both individual and collective scales.

Memory as a Neurological and Spatial Phenomenon

Eberhard (2009) argues that architecture plays a significant role in shaping human experience by influencing perception, emotion, and memory. He explains that sensory inputs light, sound, and spatial configuration are integrated within the brain to form what he terms 'dispositional memory': past experiences of space stored and later recalled through similar environmental stimulation. Memory, in this understanding, is not purely psychological but is directly produced and triggered by architectural environments. Abbas (2024) expand on this by

identifying the hippocampus and the parahippocampal place area (PPA) as the key brain regions responsible for spatial recognition, navigation, and memory formation. They argue that architectural environments contribute to the creation of 'cognitive maps,' through which individuals organize and remember spatial information. Together, Eberhard (2009) and Abbas (2024) establish that memory is not a passive mental process but one actively shaped by the sensory and spatial qualities of the built environment.

Neuroarchitecture and Subconscious Spatial Experience

De Paiva (2018) argues that architectural environments shape emotional responses and behaviors at a subconscious level, with elements such as lighting, ceiling height, and spatial configuration priming individuals without their conscious awareness. Chatterjee (2021) contributes the concept of neurasthenics, arguing that the brain's responses to architectural spaces involve both cognitive and emotional dimensions that are deeply intertwined. Pallasmaa (2005) reinforces this through a phenomenological lens, contending that the most persistent memories of space are commonly its sounds and smells rather than its visual form, and that olfactory and acoustic stimuli can awaken spatial memories entirely inaccessible to visual recall. Collectively, these positions establish neuroarchitecture as a discipline grounding architecture in measurable neurological processes rather than subjective experience alone.

Cultural Memory and the Spirit of Place

Rossi (1984) argues that cities and buildings act as repositories of collective memory, where architectural forms preserve historical continuity and cultural meaning over time. Urban artefacts accumulate layers of meaning that allow individuals to connect personal experience with broader collective identity, making architecture a cultural and temporal construct rather than merely a functional one. Norberg-Schulz (1980) introduces the concept of *genius loci* the 'spirit of place' arguing that every built environment carries a unique character shaped by its physical, cultural, and historical qualities, and that meaningful architecture must respond to the existential and sensory qualities of its context. Pallasmaa (2005) links these collective dimensions to individual embodied perception, establishing that it is through the body and its sensory engagement with space that personal and cultural identity are simultaneously formed.

Theoretical Relationships

The three concepts operate in structured relationships. Neuroarchitecture explains how architectural memory is formed at the neurological level: Eberhard (2009) and Abbas (2024) show that the brain encodes spatial environments through sensory input, while De Paiva (2018) identifies this as a predominantly subconscious process. Cultural memory, theorized by Rossi (1984) and Norberg-Schulz (1980), operates at a collective scale, preserving meaning across time and generations. Pallasmaa (2005) connects the two through embodied perception. In Bahrain, traditional houses function at precisely this intersection: their spatial and sensory richness generates neurologically durable memories, and their typological repetition across an entire urban fabric enables them to function as shared mnemonic infrastructure the material basis of collective cultural identity.

Review of Literature

Research into the relationship between architecture, memory, and identity has expanded considerably in recent years. Existing studies have examined how built environments influence perception, emotional attachment, spatial memory, and sense of place. While a growing body of research exists within neuroscience, architecture, and environmental psychology, much of this research focuses on general human responses to space rather than culturally specific architectural environments. Research addressing the role of traditional architecture in sustaining collective memory and cultural identity remains comparatively limited, particularly within the context of Bahrain. This review therefore examines the status of knowledge relating to architecture and memory, identifies key findings from previous research, and highlights gaps that justify further investigation.

From a neuroscientific perspective, Eberhard (2009) argues that architecture plays a significant role in shaping human experience by influencing perception, emotion, and memory through the integration of sensory inputs within the brain. His concept of dispositional memory where past experiences of space are stored and later recalled through similar environmental stimulation provides a foundational neurological explanation for the emotional resonance of familiar architectural environments. However, Eberhard's work remains largely theoretical and does not provide specific architectural strategies, limiting its direct application in practice.

Expanding on this, Abbas (2024) introduces neuroarchitecture as a field examining how the brain responds to build environments. Their study identifies the hippocampus and the parahippocampal place area (PPA) as responsible for spatial recognition, navigation, and memory formation, and argues that architectural environments contribute to the creation of cognitive maps that allow individuals to organize and remember spatial information. Nevertheless, the study focuses primarily on general human responses and lacks consideration of cultural and contextual differences essential to heritage architectural contexts.

De Paiva (2018) argues that architectural environments shape emotional responses and behavior without users being consciously aware of it: lighting, ceiling height, and spatial configuration prime individuals, influencing how they feel, behave, and remember a space. De Paiva acknowledges that these responses are not universal, varying depending on individual experience and cultural background, a limitation that becomes particularly significant in vernacular and heritage contexts. Chatterjee (2021) extends this through neuroaesthetics, establishing that architectural beauty and spatial richness produce measurable neurological responses in both cognitive and emotional brain systems.

Within Bahrain specifically, Yarwood and El-Masri (2005) document how spatial elements such as internal courtyards, wind towers, and coral stone walls were not merely climatically functional but socially and symbolically charged, organizing family life, rituals, and daily interaction in ways that created deep spatial memory. The courtyard served as what they describe as the spatial and social heart of the Bahraini house, where generations of family life and seasonal rituals were anchored. Braz and Bartels (2017) reinforce this, documenting how the consistency of the courtyard typology extended to the organization of entire neighborhoods, enabling the transmission of collective memory at an urban rather than merely domestic scale.

Alfadhel and Elghonaimy (2025) examine the transformation of Manama's urban environment, highlighting how globalization and the adoption of international architectural styles have led to a loss of local identity. Their study argues that many contemporary buildings lack cultural references and emotional resonance, resulting in environments that are visually dominant but cognitively and culturally disconnected.

The authors emphasize the importance of integrating local identity and cultural meaning into architectural design to maintain continuity of memory. Dayaratne (2021) traces this process typologically, documenting the progressive replacement of vernacular spatial forms by hybrid and then fully imported modernist typologies in Bahrain's built environment.

Shubbar et al. (2025) highlights the role of cultural heritage in urban regeneration in Manama, emphasizing how historic environments contribute to sustaining collective identity and demonstrating the growing recognition at policy and institutional levels that the loss of traditional built fabric represents a cultural as well as physical loss.

The reviewed literature demonstrates a gap between neuroscientific universalism and cultural specificity. Neuroscience explains how memory is formed but often lacks cultural sensitivity; architectural theory addresses cultural identity but does not fully engage with cognitive and neurological processes. This research proposes an integrated approach combining both, applied to the specific context of traditional Bahraini houses in Manama.

Research Methodology

This research adopts a qualitative case study design. A qualitative approach is appropriate because the central questions concern lived experience, spatial perception, and cultural meaning phenomena best captured through narrative, observation, and spatial analysis

rather than quantitative measurement (Creswell, 2013). Three complementary data collection methods were employed sequentially and triangulated to validate interpretations.

Semi-Structured Interviews

The primary method was semi-structured interviews conducted with twelve participants including former and current residents of traditional houses in Manama, heritage professionals, and architects. The semi-structured format was chosen to allow participants to speak freely while ensuring comparability across responses. An interview guide was prepared in advance. Questions focused on participants' memories of traditional houses, emotional attachment to specific architectural elements, experiences of relocation, perceptions of contemporary housing environments, personal narratives of spatial memory, and emotional responses to the *hoosh* and *badageer*. Interviews were conducted in Arabic and English depending on participant preference, audio-recorded with informed consent, transcribed in full, and analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework. Codes were organized around the three theoretical pillars of the research: neuroarchitecture memory, sensory experience, and cultural identity.

Direct Observations and Spatial Documentations

Site visits were conducted at two locations: a double courtyard merchant house in Manama's historic core, and a traditional-style apartment belonging to my grandma, which lacks a courtyard. This deliberate pairing allowed for comparison between the full courtyard typology and a deeply inhabited domestic environment whose attachment value derives from personal history rather than spatial complexity. Each visit involved annotated floor plan sketches, systematic photography, and written sensory field notes capturing light quality, spatial sequence, material texture, and acoustic characters. Where possible, walkthroughs were conducted alongside interview participants to capture real time spatial memory responses, following the methodology demonstrated by Al Saif (2024) in her sensory ethnography of *Souq el Manama*. These observations were interpreted using space syntax principles to assess spatial hierarchy and memory forming configuration.

Archival and Documentary Analysis

Secondary data was gathered from the Bahrain Authority for Culture and Antiquities and publicly available digital sources, the government body responsible for the documentation and protection of Bahrain's built heritage, including historical architectural drawings, heritage condition surveys, and photographic archives spanning the early 19s to the present. These documentary sources provided a longitudinal dimension, enabling direct comparison of original spatial configurations with current conditions and contextualizing primary findings within broader patterns of urban transformation. Archival findings were triangulated with published studies including Shubbar et al. (2025), Alfadhel and Elghonaimy (2025), and Dayaratne (2021). The full list of archival documents consulted is presented in Table 3 of the Findings section.

Findings

Data was gathered through three methods: semi-structured interviews with twelve participants, direct spatial observation at two sites, and archival analysis of materials held by the Bahrain Authority for Culture and Antiquities and publicly available digital sources. Findings are presented under each method in turn.

Findings from the Interviews

Twelve semi-structured interviews were conducted with participants ranging in age from 21 to 72. Interviews lasted between 10 and 30 minutes. All sessions were audio recorded with informed consent, transcribed in full, and analyzed using thematic analysis. Table 1 presents the participant profile and key themes raised.

Table 1: Interview participant profile and key themes
Source: Author

No	Participant	Age	Background	Key Theme Raised
P1	Male Manama	70	Lived in courtyard house for 40+ years	Courtyard as center of all family memory; impossible to replicate in modern houses.
P2	Current resident, Male Muharraq	58	Continues to inhabit traditional house	Sensory familiarity of badageer air as primary spatial orientation
P3	Former male architect (relative family member)	68	Restoration of traditional houses,	Incremental material loss erodes mnemonic capacity before demolition occurs
P4	Former resident, relocated	64	Moved to apartment in 1990s	New apartment 'efficient but empty'; misses spatial rhythm of a typical hoosh
P5	Former resident, relocated, male	50	Moved to subsidized housing in 2005	Loss of neighborhood sensory texture; no equivalent in modern development
P6	Former resident, relocated, male	39	Moved to an Iskan house in early 2000	It feels plain... not like how it used to. I just miss our old courtyard and the breeze of the small Badageer
P7	Female former resident	72	Courtyard house, Manama historic core	Hoosh as private sky; sky visible from interior was essential to daily rhythm
P8	Female former resident	55	Merchant family house, semi-demolished 2003	Coral stone wall texture and smell as most persistent physical memory
P9	Architecture student-Female	21	Grew up in hybrid traditional house	Lacks full courtyard but retains spatial memory through repeated inhabitation
P10	Urban planner, municipality	47	Involved in Manama urban renewal	Tension between heritage value and development pressure unresolved
P11	Female current resident	61	Traditional house, Manama	Seasonal rituals in courtyard as the primary vehicle of family memory transmission
P12	Female former resident	43	Relocated from traditional house in 2012	Contemporary housing lacks spatial markers; all rooms feel interchangeable

The courtyard (hoosh) was identified by all twelve participants as the most emotionally and memorially significant spatial element of the traditional house. Eberhard (2009) explains this neurologically through dispositional memory: environments inhabited consistently over years become deeply encoded through repeated sensory stimulation. Abbas (2024) identify the hippocampus and parahippocampal place area as the brain regions responsible, arguing that the spatial richness of the traditional house generates more durable cognitive maps than the undifferentiated layouts of contemporary housing.

The badageer was described by participants primarily in sensory terms its sound, the thermal sensation of cooled air, and its role as a temporal and spatial anchor rather than in visual or architectural terms. Pallasmaa (2005) argues that the most persistent memories of space are commonly its sounds and smells rather than its visual form. De Paiva (2018) supports this at the neurological level, demonstrating that familiar sensory environments produce subconscious priming effects that reduce stress and reinforce emotional attachment.

Participants who had relocated from traditional houses to contemporary apartments consistently described their new environments as 'efficient but empty,' noting an absence of sensory richness and social structuring. Alfadhel and Elghonaimy (2025) identify this because of international architectural styles that lack cultural references and emotional resonance. Chatterjee (2021) provides the neurological basis: spaces offering sensory richness and material variation stimulate deeper neural engagement.

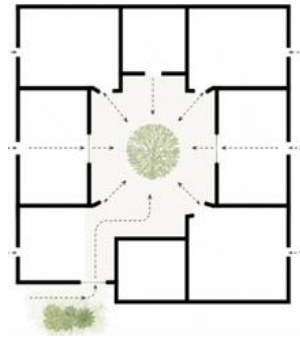


Fig. 1-a: A typical traditional Bahraini courtyard house with the central hoosh and surrounding room connections.
Source: Publicly available architectural photography, Manama historic core.

Table 2: Selected interview responses by spatial element

Source: Author

Spatial Element	Selected Interview Response	Theoretical Link
Courtyard (hoosh)	"Everything happened around the hoosh morning tea, evening gatherings, the sound of rain on the stone. If I close my eyes and think of home, I see the courtyard first." (P1)	Dispositional memory (Eberhard, 2009); cognitive map formation (Abbas, 2024)
Badageer (wind tower)	"I used to wake at night and find my way by the direction of the air. I did not need light." (P2)	Subconscious sensory priming; acoustic and thermal memory (Pallasmaa, 2005)
Material texture	"I reached out and touched the wall without thinking. I had forgotten I used to do that as a child." (P8)	Embodied memory; multi-sensory encoding (De Paiva, 2018)
Spatial transition	"This is it. This is exactly the feeling." spoken at the threshold of the courtyard (P3 walkthrough)	Reenactment of spatial memory; hippocampal re-engagement (Abbas, 2024)
Contemporary housing	"Efficient but empty. Everything works but nothing feels like anything." (P4)	Sensory neutrality; cultural disconnection (Alfadhel and Elghonaimy, 2025)
Seasonal rituals	"Ramadan in the courtyard was when I understood what family meant. That cannot happen in a flat." (P11)	Architecture as vehicle for cultural memory transmission (Rossi, 1984)
Neighborhoods fabric	"The sounds of the street, the neighbors, the smell of the lane all gone. There is no equivalent." (P5)	Collective sensory memory; genius loci (Norberg-Schulz, 1980)

Findings from the Spatial Observations

The double courtyard merchant house demonstrated the characteristic entrance-to-courtyard transition described by Yarwood and El-Masri (2005): a compressed passage opening abruptly into the full vertical volume of the courtyard, producing a striking contrast in light, sound, and thermal conditions. Participants re-entering after years of absence responded with immediate embodied recognition. One paused at the courtyard threshold and said: 'This is it. This is exactly the feeling.' Pallasmaa (2005) argues that spatial memories are stored in the body as much as in the mind, so that re-entering a familiar sequence trigger recall that bypasses deliberate cognitive effort.

The coral stone walls intensified this response: their irregular texture, thermal mass, and the smell of aged lime plaster generated involuntary sensory memory responses in multiple participants, with one reaching to touch a wall unprompted and recalling: 'I used to do this as a child. I forgot about this until now.' De Paiva (2018) identifies this as subconscious sensory priming, while Eberhard (2009) argues that multi-sensory environmental richness is central to

the formation of durable dispositional memory. Returning residents also navigated spatial sequences with striking confidence despite years of absence, confirming Abbas (2024) argument that the hippocampus encodes spatially rich environments as durable cognitive maps.

The visit to the traditional style apartment introduced an important counterpoint. The apartment does not possess a courtyard, badageer, or the spatial sequencing of the courtyard typology. Yet the emotional attachment it generates is profound and immediate. The smell of the entrance, the quality of light in the main room, the sound of the building's stairwell, and the texture of its walls were experienced as intensely familiar and emotionally resonant — not because of architectural complexity but because of the depth and repetition of personal history embedded in the space. This finding does not contradict the argument for the courtyard house but refines it: attachment is formed through lived experience rather than spatial sophistication alone. The significance of the courtyard house lies in the fact that its spatial and sensory richness actively supports and deepens that process, making memory both more durable and more transmissible across generations.

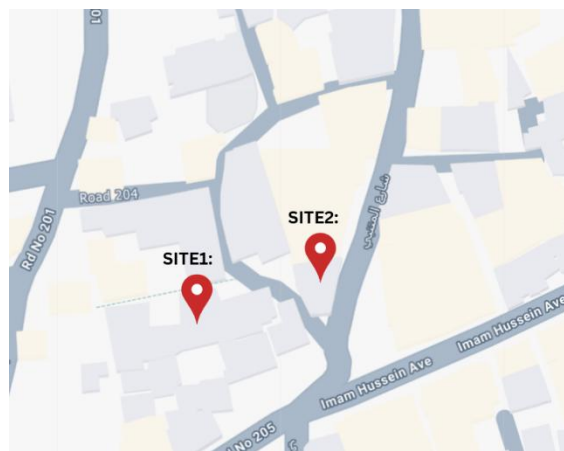


Fig. 1.b: site visit locations

Source: Author

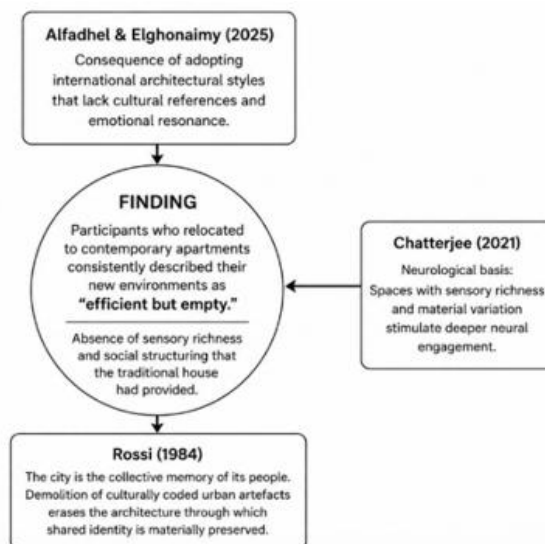


Fig. 2: 'Efficient but Empty': Psychological and cultural effects of contemporary housing displacement on former residents of traditional Bahraini houses.

Source: Publicly available architectural photography, Manama historic core.

Table 3 presents the archival documents consulted from the Bahrain Authority for Culture and Antiquities and related institutional sources. These documents provided the longitudinal evidence base for understanding the pattern and pace of urban transformation in Manama's traditional residential fabric.

Table 3: Archival documents consulted

Source: Bahrain Authority for Culture and Antiquities and publicly available sources

Document Title	Source	Relevance to Research
Historical Survey of Manama Traditional Houses	Bahrain Authority for Culture and Antiquities	Condition assessment of surviving courtyard houses; classification by heritage risk level
Architectural Drawing Set: Merchant House, Manama	A walk through during a site visit	Original floor plans and elevations of double courtyard merchant house; spatial layout documentation
Photographic Archive: Manama Historic Core 1960–2010	Publicly available sources in web	Sequential photographic record of urban transformation across five decades
Urban Regeneration Study: Manama Historic Districts	Publicly available sources in web	Analysis of urban fabric erosion; documentation of typological replacement patterns
Catalogue of Vernacular Building Materials: Bahrain	Publicly available sources in web	Material inventory including coral stone, lime plaster, and gypsum; thermal and acoustic properties documented
Courtyard house spatial diagrams and floor plan documentation	Publicly available architectural photography, Manama historic core	Visual documentation of hoosh spatial organization and room configurations used in Figure 1
Contemporary vs traditional housing: visual comparison	Publicly available architectural photography, Manama historic core	Photographic evidence of displacement effects and spatial character contrast used in Figure 2
Urban transformation imagery: Manama historic core	Publicly available architectural photography, Manama historic core	Comparative visual record of courtyard neighborhoods versus modern developments used in Figure 3

Photographic archives document the progressive transformation of Manama's historic core: photographs from the 1960s show intact residential neighborhoods structured around courtyard house clusters; by the 2000s, the same areas show substantial replacement by multi-story developments with no spatial or material continuity. Heritage condition surveys classify most surviving traditional houses as 'at risk,' with only a small number under formal protection. Historical drawings confirm the remarkable typological consistency of the courtyard house across buildings of different scales and periods, supporting Rossi's (1984) argument that typological repetition enables an architectural form to function as collective mnemonic infrastructure. Comparison of original plans with current conditions reveals a pattern of incremental modification courtyard subdivision, arcade infilling, replacement of lime plaster with cement render that cumulatively removes the sensory conditions through which memory is sustained.



Fig. 3: Comparative urban transformation: courtyard housing clusters in Manama's historic core (1960s) versus modern developments (2000s–present).

Source: Publicly available architectural photography, Manama historic core

Analysis and Discussion

Data from the three methods were analyzed thematically and triangulated to identify patterns across interview responses, spatial observation, and archival evidence. Five principal themes emerged from the analysis.

Table 4: Thematic analysis: patterns across all three data sources

Source: Author

Theme	Spatial Elements	Evidence	Theoretical Basis
Spatial Memory & Attachment	Courtyard, badageer, material texture	All 12 participants; strongest emotional responses	Dispositional memory (Eberhard, 2009); cognitive mapping (Abbas, 2024)
Sensory Richness vs. Neutrality	Contrast between traditional and contemporary	10 of 12 participants made explicit comparison	Neuroaesthetics (Chatterjee, 2021); subconscious priming (De Paiva, 2018)
Collective vs. Personal Memory	Shared courtyard rituals; neighborhood fabric	8 participants referenced communal memory	Collective memory (Rossi, 1984); genius loci (Norberg-Schulz, 1980)
Incremental Erasure	Material modification; arcade infill; replastering	Heritage professional (P3, P6); archival evidence	Architectural amnesia framework (Eberhard, 2009; Pallasmaa, 2005)
Attachment Without Typology	Grandmother's apartment; deeply inhabited spaces	P9, spatial observation data	Inhabitation over time as primary mechanism (Eberhard, 2009; Pallasmaa, 2005)

Theme 1: The Courtyard as Primary Mnemonic Site

The unanimous identification of the hoosh across all twelve interviews, combined with the immediate embodied responses observed during spatial walkthroughs, confirms that the courtyard functions as the primary neurological anchor of the traditional Bahraini house. Eberhard's (2009) framework of dispositional memory explains this: the hoosh provided the consistent, multi-sensory environment light, sound, thermal variation, spatial scale through which the brain formed stable and durable spatial memories. Abbas (2024) extend this, demonstrating that the hippocampus encodes such environments as cognitive maps that persist long after inhabitation ends. The convergence of interview testimony, observational data, and archival typological evidence provides strong triangulated support for this finding.

Theme 2: Sensory Richness vs. Contemporary Sensory Neutrality

The consistent description of contemporary apartments as 'efficient but empty' across ten of twelve interviews represents one of the most significant findings of this research. Chatterjee (2021) establishes that spatial richness and material variation stimulate neural engagement deeper than sensory neutral environments; De Paiva (2018) demonstrates that this process operates subconsciously, through priming effects that shape mood, behaviors, and memory without deliberate awareness. Contemporary standardized housing, designed to minimize material variation and maximize spatial efficiency, systematically removes the sensory conditions through which neurologically durable memory is formed. This represents not merely an aesthetic preference but a measurable cognitive and cultural loss.

Theme 3: Collective vs. Personal Memory — The Courtyard as Shared Infrastructure

The observation at the traditional-style apartment introduced an important nuance: attachment can form in any deeply inhabited space, regardless of typological sophistication. Eberhard (2009) and Pallasmaa (2005) both confirm that repetition of sensory experience is the primary mechanism of dispositional memory. What distinguishes the courtyard typology, however, is its capacity to support collective and transmissible memory at a cultural scale. As Rossi (1984) argues, the repetition of an architectural type across an urban fabric enables it to function as a shared mnemonic infrastructure a cultural rather than merely personal repository. No individual apartment, however beloved, can replicate this function. This distinction is critical to the research argument: the case for preserving traditional Bahraini houses is not that individuals cannot form attachments elsewhere, but that no contemporary typology supports the collective transmission of cultural identity in the same way.

Theme 4: Incremental Erasure and Architectural Amnesia

Archival analysis revealed that the erosion of traditional Bahraini houses is not primarily driven by sudden demolition but by incremental material modification: courtyard subdivision, arcade infilling, replacement of lime plaster with cement render. Each modification reduces the sensory richness of the environment without removing the building. Eberhard's (2009) framework, extended through Pallasmaa (2005) and De Paiva (2018), establishes that it is the specific material and sensory qualities of a space not its structural form that generate the neurological responses through which memory is formed. A building can remain standing while the mnemonic environment it once sustained is progressively dissolved. This finding has direct implications for heritage policy: protecting the structural shell of a traditional house without preserving its material character and sensory conditions is insufficient to preserve its neurological and cultural function.

Theme 5: The Badageer as Neurological Anchor

The badageer emerged consistently as a sensory rather than visual memory anchor, experienced through the acoustic quality of its air movement and the thermal sensation of cooled air rather than its architectural appearance. Nine of twelve participants referenced the badageer in sensory terms. Pallasmaa (2005) argues that olfactory and acoustic stimuli can awaken spatial memories entirely inaccessible to visual recall; De Paiva (2018) demonstrates that such sensory stimuli prime emotional and behavioral responses subconsciously. The loss of the badageer from contemporary housing therefore represents a neurological loss: the removal of a sensory trigger through which a fundamental layer of spatial memory was sustained.

Conclusions

This research examines the ways in which meanings, memories, and emotional attachments are preserved in vernacular Settings. It specifically employs neuroscience to gain insights from the traditional houses in Bahrain. The conclusions are drawn directly from the data gathered and analysed across three methods. They are presented in the Table 5 below, paired with their evidential basis, followed by a synthesizing discussion.

Table 5: Research Conclusions and Evidential Basis

Source: Author

Conclusion	Basis in Data
Traditional Bahraini courtyard houses function as neurologically rich mnemonic environments	Confirmed by all 12 interview participants and spatial observation data
The hoosh is the primary site of spatial memory formation and emotional attachment	Unanimously identified across interviews; supported by Eberhard (2009) and Abbas (2024)
Sensory elements badageer, coral stone, lime plaster encode memory at a neurological level	Reported in 9 of 12 interviews; theoretically grounded in Pallasmaa (2005) and De Paiva (2018)
Contemporary housing produces emotional disconnection through sensory neutrality	Described by 10 of 12 relocated participants; supported by Alfadhel and Elghonaimy (2025)
Attachment can form in any deeply inhabited space, but the courtyard typology uniquely supports collective and transmissible memory	Grandmother's house observation; Rossi (1984); absent in modern typologies
Architectural memory erodes incrementally through material modification before demolition	Archival photographic comparison documented by heritage condition surveys; Eberhard (2009) framework
Preservation of traditional houses is a neurological and cultural necessity, not merely aesthetic	Synthesis across all three data sources

This research demonstrates that traditional Bahraini courtyard houses are not simply architectural heritage but neurologically active environments whose spatial and sensory qualities directly support the formation of durable memory, emotional attachment, and collective cultural identity. The hoosh and badageer are not merely cultural symbols but neurological infrastructure: the specific material and sensory conditions through which the human brain encodes place, belonging, and identity.

The finding that attachment can form in any deeply inhabited space does not weaken this argument. It sharpens it. What the courtyard typology provides, and what no individual apartment can replicate, is the capacity to sustain collective and transmissible memory on a cultural scale. The repetition of the courtyard house across Manama's historic fabric created a shared mnemonic infrastructure: a city whose spatial form was itself the collective memory of its people (Rossi, 1984).

The erosion of this infrastructure through incremental material modification as much as outright demolition represents a process of architectural amnesia in which buildings remain standing while the mnemonic environments they once sustained are progressively dissolved. To preserve traditional Bahraini houses is therefore not to conserve picturesque remnants of the past. It is to protect the sensory and cultural landscapes through which people continue to remember, belong, and emotionally inhabit the world around them.

It is to be admitted that although this research began as an academic inquiry, it became something more personal in the process. Walking through the courtyard of the merchant house in Manama, watching the participants reach out to touch the coral stone walls they had not felt in decades, hearing an elderly man describe the sound of the Badageer as the thing he missed most about home were deeply touching. These moments made clear that what is at stake in the disappearance of traditional Bahraini architecture is not a matter of aesthetics or nostalgia. It is a matter of who we are and how we remember being ourselves.

Architecture is the oldest form of collective memory humanity has ever built. In Bahrain, that memory is written in courtyards and wind towers, in lime plaster, the smell of rain on stone and our old houses that used to bring families together on one table. To let it disappear without resistance is to agree, quietly, to forget.

This research contributes thus to bring to the attention of the authorities as well as the community, how important it is to retain the cultural memories of the past through architecture even through elements and elements often considered insignificant. This is the most valuable

contribution this research has made and is indeed its strength. However, it is inadequate. The weaknesses of the research is that it has not examined the vast array of other situations and traditional settings, which if one is to closely examine, will yield much greater insights.

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Ethical Practice: This research followed accepted ethical practices. It did not involve any personal data, nor did it coerce any participants to take part in this research under pressure. No person has been identified.

Availability of Data: Data presented in this research is available for scrutiny by any legitimate organization.

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