

## Emotionally Immersive Spatial Poetics in Heritage Reuse: Child-Focused Narratives from the Pan Residence, Shanghai

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### ABSTRACT

This study examines the immersive, narrative-driven transformation of the Pan Residence, a traditional courtyard dwelling located in the heritage zone of Yuyuan Road in Shanghai. Located in a dense urban area, the residence has been transformed into an experiential space designed to be child-friendly, blending conservation, storytelling and participatory spatial design. Through site analysis, behaviour mapping and semi-structured interviews with parents, children and designers, the study reveals how spatial dramaturgy can encourage interaction with intangible cultural heritage via sensory and narrative prompts. The study proposes a dramaturgical model to frame visitor experience sequences and provides a comparative analysis with cases in Kyoto and Barcelona to contextualise the Pan Residence within broader heritage reuse trends. The findings emphasise that small-scale adaptive interventions, such as tactile material palettes, reversible thresholds and participatory design elements, can balance heritage conservation with community needs, particularly in small residential heritage sites. This research contributes to cultural heritage management by integrating spatial poetics, sustainable reuse strategies and user-centred design approaches into the adaptive reuse of domestic heritage architecture. The study concludes with a framework for experience-led, inclusive heritage transformation that emphasises children as co-authors of cultural memory and advocates for future stewardship.

**Keywords:** Heritage Reuse, Immersive Spatial Narratives, Child-Friendly Design, Participatory Conservation Cultural Heritage Management

### INTRODUCTION

#### Heritage Typology and Urban Transformation

Situated at the end of an alleyway in the Yuyuan Road Historic Corridor of Changning District, Shanghai, the Pan Residence is a prime example of adaptive reuse within a dense urban environment. Architecturally, it exemplifies the 'Scholar's Mansion' typology, characterised by inward-facing courtyards, axial organisation and a distinct sense of introverted privacy. This typology is emblematic of traditional elite residences in Jiangnan, where the spatial order mirrored the Confucian values of hierarchy, ritual and inward contemplation (Zheng, Chen & Heath, 2024). As Shanghai undergoes extensive urban renewal and commercial gentrification efforts, the

Pan Residence has become a focal point of contention between cultural continuity and market-driven redevelopment pressures.

**Table 1.** Urban context of the Pan Residence within the Yuyuan Road heritage zone

Aspect	Description
Location	End of an alleyway in Yuyuan Road Historic Corridor, Changning District
Heritage Typology	"Scholar's Mansion" with inward courtyards and axial symmetry
Surrounding Fabric	Mixture of 1920s Shikumen, modern cafés, galleries, and residential blocks
Cultural Layering	Transition zone blending everyday life, commercial leisure, and nostalgia
Urban Function	Node of "point–line–plane" urban renewal: heritage (point), commercial axis (line), and 15-min living circle (plane)
Current Challenges	Gentrification pressures; tension between conservation and experiential reuse

As shown in Table 1, its location within a hybrid urban fabric comprising 1920s Shikumen buildings, contemporary cafés, galleries and residential blocks positions it as a critical node in the transition from everyday life to commodified nostalgia. Its function intersects with the 'point–line–plane' logic of urban transformation: it is a heritage point, a commercial axis and a unit within the 15-minute living circle (Chen, Chen & Liu, 2025). These dynamics mirror broader tensions evident in heritage renovation projects worldwide, exemplified by Kengo Kuma's reinterpretation of Gaudí's Casa Batlló, which reimagines cultural memory through a non-Western lens, challenging notions of material permanence and championing spatial poetics (Lu & Sádaba, 2024). Similarly, the Pan Residence navigates the balance between preserving cultural layering and enabling experiential reuse. This echoes observations from Shanghai's industrial heritage sites, where visitor satisfaction is shaped by the degree of participatory engagement and transformation success (Fang, Yao & Shi, 2024). Thus, its renovation becomes more than a material intervention; it represents a symbolic reweaving of historic typology into contemporary spatial narratives. Notably, the project contends with critical challenges such as gentrification-induced displacement and the tension between conservation authenticity and commercial performance (Zheng et al., 2024). These tensions highlight the necessity of nuanced evaluation frameworks that consider cultural identity, spatial hierarchy and stakeholder perceptions throughout the transformation process. Grounding the discussion in a typological lens and drawing on precedents from Chinese and international contexts lays the groundwork for evaluating how immersive design strategies can reconcile the Pan Residence's historical depth with its evolving urban role.

### From Fabric to Meaning: A Shift in Heritage Paradigms

**Table 2.** Comparative models of heritage reuse (Shanghai–Kyoto–Barcelona)

Dimension	Shanghai (Pan Residence)	Kyoto (Machiya District)	Barcelona (Casa Bloc, El Born CCM)
Heritage Typology	Domestic courtyard (Scholar's Mansion)	Wooden townhouses (Machiya)	Industrial/civic modernism
Reuse Strategy	Child-friendly immersive reuse via narrative dramaturgy	Minimal intervention with cultural tourism integration	Mixed-use adaptive reuse (exhibition, housing, education)
Governance Model	Semi-private initiative with state policy framework	Community-led with city-level preservation ordinances	Public–private partnerships
Interpretive Method	Spatial storytelling; Kunqu opera-inspired stages	Architectural authenticity and slow tourism	Digital reconstruction + layered historical narratives
Key Users	Children, families, educators	Tourists, scholars, local residents	Public, students, urban historians
Conservation Ethos	Reversibility, narrative anchoring, symbolic preservation	Material purity and continuity	Legibility of time layers and democratic memory

Traditional Chinese heritage governance frameworks, such as the Historic Block Protection Act, prioritise the preservation of architectural integrity and material authenticity. However, emerging design research increasingly supports a paradigm shift from static conservation towards dynamic interpretation. Adopting the

principles set out in the ICOMOS (2008) and Burra (2013) Charters, this paper advocates interpretive reuse as a means of mediating cultural significance through spatial poetics, embodied cognition and narrative activation. Unlike preservation models based on physical repairs and façade control, interpretive reuse creates a more fluid, visitor-centred experience by transforming heritage sites into immersive cultural encounters. Hu, Li and Cao (2022) emphasise that embodied cognition, through which users process spatial and material cues, can reshape heritage understanding via sensory, bodily and contextual dimensions. Their model, which incorporates environment, corporeality, and cognitive activity, closely aligns with the objectives of immersive heritage transformation, in which meaning is not simply inherited, but rather reconstituted through user engagement and experiential storytelling.

Table 2 illustrates this shift by mapping the Pan Residence dramaturgically, emphasising how sequential encounters at the site create layers of interpretation and emotional resonance. Rather than prioritising fixed visual form, the table emphasises performative thresholds, narrative pacing and emotional zones, thus echoing Djabarouti's (2021) argument that built heritage should be reconceptualised as a storytelling process. His UK-based research shows that intangible heritage, such as emotions, events and memories, can be incorporated into the built environment by acknowledging the collaboration between buildings and their users. Similarly, García-Fuentes (2010) calls for a 'creative paradigm' of heritage, in which recycling is not just material, but also semiotic and capable of adapting to changing cultural needs. Within this conceptual landscape, refugee heritage studies (Al Shallah, 2023) emphasise that preservation must extend beyond physical elements to include relational and identity-based meanings. In the case of the Pan Residence, this involves leveraging layered domesticity, nostalgia and sensory transitions to evoke cultural continuity amidst rapid urban change. Thus, heritage design becomes the act not just of protecting the past, but of crafting new interpretive futures that are rooted in bodily experience, narrative structure and cross-temporal engagement.

### **Aim and Research Questions**

The research explores how the principles of spatial poetics, which integrates symbolic space, dramaturgical structure and sensory immersion, can be used to develop child-friendly adaptive reuse strategies for urban domestic heritage in the Pan Residence in Shanghai. Although heritage discourse has historically focused on materialist agendas, this article shifts the focus towards interpretative engagement (Smith, 2006) and, in particular, the potential of spatial storytelling to foster inclusive, intergenerational encounters. The key argument is that the symbolic and narrative mobilisation of space generates emotional engagement and an educational impact, particularly with children. Building on Holtorf and Bolin's (2014) conceptualisation of heritage futures as a forward-looking strategic cultural practice, the article investigates how design interventions can move away from reductive conservation models and influence future-oriented heritage engagement. Their dialogical approach emphasises the importance of considering not only what heritage is, but also what it could become in response to evolving social demands and requirements — a particularly potent concept in youth design.

Accordingly, this paper addresses three interrelated research questions:

1. How can narrative-driven reuse balance physical integrity and intangible meaning?
2. How does immersive spatial storytelling engage intergenerational users?
3. Can small-scale heritage sites function as educational and cultural bridges?

These questions reflect the ongoing call among scholars to expand the scope of heritage research beyond architectural typologies to include cultural activism and experiential frameworks. Jones, Mozaffari and Jasper (2017) contend that heritage disputes are firmly rooted in social movements and necessitate a critical examination of how values, identities and meanings are negotiated within contested heritage spaces. Their application of social movement theory to heritage research emphasises the significance of emotional symbolism and collective narratives — concepts that form the basis of this study's dramaturgical approach. Similarly, Copping and Martin (2005) observe that heritage research must address fragmented agendas and under-explored user perspectives, particularly in small-scale, localised contexts. They emphasise that asking the 'right questions' is essential for refining the heritage research agenda — a perspective echoed here in framing spatial poetics as a methodological and conceptual bridge. Together, these works inform the analytical framework of this study and support its aim to reconceptualise urban domestic heritage as a participatory and pedagogical resource rather than as an object of preservation alone.

## **METHODOLOGY**

### **Architectural Survey and Typological Analysis**

A comprehensive methodology combining measured drawings, archival research and photogrammetric modelling was employed to conduct an architectural survey of the Pan Residence. These tools were instrumental

in reconstructing the original spatial configuration of the residence before renovation. Archival materials offered historical insights into the evolution of the typology of courtyard-based domestic architecture, while photogrammetric reconstructions allowed for precise 3D modelling to verify and compare the spatial layout across historical phases. The analysis was situated within the broader typological taxonomies of Chinese domestic heritage, enabling a nuanced interpretation of the site's cultural significance and spatial organisation. This method of typological mapping can be compared to the academic study of musical and literary poetics, in which spatial and symbolic forms are constantly reshaped in different contexts (Zhou, 2022; Xinan, 2007). Figure 2 illustrates the ground plan and typological mapping of the Pan Residence, indicating its hybrid access system via Spring Lane and dual park-retail thresholds, which exemplify the intersection of traditional configuration and modern circulation demands.



**Figure 2.** Ground plan and typological mapping of Pan Residence

This architectural study's classification system reflects deeper cultural codifications. As in the study of Central Asian Turkic ritual poetics, these codifications provide access to broader meanings and collective memory (Zholdybayev & Matyzhanov, 2024). Rather than being merely formalist, this approach connects physical typology with cultural function and heritage transmission, akin to the encoding of values in intangible heritage forms such as instrumental poetics and Sanskrit aesthetics (Zhou, 2022; Xinan, 2007). The renovation strategy therefore involved not only structural retrofitting, but also symbolic rearticulation — preserving localised meaning while enabling new use cases. As can be seen in Figure 3, the aerial view shows a sensitive design solution that blends the historic tiled roof morphology with the inserted wooden facades and layered communal spaces. This architectural language reactivates the compound as a node of heritage sustainability, mirroring the adaptive continuity observed in poetic traditions. The residence becomes a performative interface — both spatial and cultural — where users encounter renewed meaning in familiar forms. As in heritage poetics, architecture becomes a medium for encoding evolving identities within a continuous historical framework.



**Figure 3.** Aerial view of the renovation effect

### Conservation Management Framework

A Conservation Impact Matrix has been developed to guide decision-making in the adaptive reuse of vernacular heritage. It systematically assesses varying degrees of intervention, reversibility and associated

conservation thresholds across different material and symbolic elements. The matrix provides a practical framework for balancing heritage integrity with spatial adaptation. As shown in Table 3, the matrix distinguishes between structural fabric, interior fixtures and symbolic thresholds. Interventions to structural fabric are kept to a minimum, focusing on non-invasive methods such as repair and reinforcement. This ensures high reversibility and preserves load-bearing elements and original courtyard geometries. This conservation-first approach is consistent with the broader principles of heritage preservation which emphasise the importance of architectural integrity and material continuity (Sethaba & Scholes, 2021).

**Table 3.** Conservation Management Matrix: fabric, fixtures, thresholds

Element Type	Intervention Level	Reversibility	Conservation Thresholds
Structural Fabric	Minimal (repair, reinforcement)	High (non-invasive methods)	Preserve load-bearing walls and courtyard geometry
Interior Fixtures	Selective replacement (e.g., lighting, shelving)	Medium (removable additions)	Maintain spatial function and typology
Symbolic Thresholds	Interpretive modification (e.g., translucent screens, altars)	High (installations detachable)	Retain ritual value and visual legibility

Interior fixtures, such as lighting and shelving, offer a moderate degree of flexibility through selective replacement and removable additions. Although reversibility is moderate, the design ensures that the spatial function and typology remain intact. The third category, symbolic thresholds including interpretive elements such as translucent screens and altars, permits a higher degree of modification. However, these are implemented through detachable installations to retain their ritual value and visual legibility. This graduated approach to conservation acknowledges that not all heritage elements bear equal symbolic or functional significance, a principle also reflected in participatory conservation strategies. As Han, Yang and Wall (2016) argue, successful conservation must consider the values and perceptions of local stakeholders, including their priorities for preservation and adaptation. Moreover, this framework echoes the findings of recent studies on heritage conservation in African contexts, which emphasise the importance of reversibility, stakeholder involvement and legal frameworks in determining conservation priorities (Gitau et al., 2024). In this case, reversibility functions not only as a technical parameter, but also as a safeguard for future reinterpretation and community co-management. By ensuring that interventions can be undone or revised, the matrix enables future stakeholders to reconfigure heritage values as cultural dynamics evolve. This flexibility is particularly important in rural regeneration projects, where striking the right balance between sustainability, community engagement and heritage protection is crucial. The Conservation Impact Matrix therefore provides a replicable conservation management tool that can be adapted to diverse socio-cultural and material contexts.

### Narrative and Spatial Sequencing Strategy

In order to bridge the gap between cultural memory and embodied experience in architectural storytelling, the IN BAMBOO project adopted a seven-stage spatial dramaturgy inspired by Peony Pavilion, a classical Kunqu opera. The architectural route was aligned with the emotional arc of the opera, beginning with 'Startled Dream', moving through 'Secret Encounter', and culminating in 'Rebirth'. Each stage was reflected in the built environment through landscape sequencing, symbolic cues, and sensory transitions. As shown in Table 4, each act of the opera was interpreted spatially through curated scenes, such as theatre courtyards, reading alcoves and tea platforms. These scenes imbued the site with narrative coherence and affective resonance. This approach to spatial poetics echoes the narrative reuse practices observed in Canada's Fort Edmonton Park and Japan's Machiya Theatre District, where cultural themes are presented as experiential pathways through architecture and the environment.

**Table 4.** Spatial dramaturgy diagram reflecting Kunqu narrative arc

Kunqu Act	Narrative Theme	Spatial Scene	Design Interpretation
Awakening Dream	First encounter with beauty	Entry garden & gate	Sensory triggers and layered thresholds
Dream Seeking	Obsession and pursuit	Meandering corridors	Framed views, winding paths for spatial immersion

Temporary Farewell	Loss and longing	Theater courtyard	Open-air stage with memory-evoking backdrop
Revival	Rebirth and reunion	Reading alcove & terrace	Uplifting light, framed sky, emotional release zone
Resolution	Reconciliation & clarity	Studio & gallery	Interactive elements symbolizing restored harmony
Transcendence	Transcendental closure	Rooftop tea platform	Overlook point with ritual calm and poetic closure

Crucially, this narrative sequencing model was developed in response to issues of spatial justice and accessibility, particularly in rural heritage contexts. Wan (2024) emphasises that heritage spatial planning must consider equitable visitor experiences, mitigating biases in tourist flow and symbolic exclusions through deliberate design. Similarly, Hou, Zhang and Ren (2022) demonstrate how spatial distribution and ecological placement reflect deeper socio-cultural meanings — a principle that is extended here to architectural choreography. Meanwhile, Zhang (2012) emphasises the role of spatial information systems in heritage mapping and storytelling, supporting the use of sequential narrative as a spatial legibility device. Within this framework, the narrative structure orchestrates visitor movement and serves conservation and educational goals by embedding ritual meaning in the architectural language.

### Ethnographic Inputs and Stakeholder Engagement

A qualitative, ethnographic approach was employed to understand how different user groups, particularly child–parent duos, experience and interpret heritage spaces. A total of 38 participants were surveyed and interviewed, including local parents, children aged 6 to 12, and cultural officers from the township bureau. Interview prompts focused on four major themes: spatial comfort, memory triggers, behavioural preferences and sensory thresholds. The insights gained were then translated into a behavioural mapping matrix (see Table 5), which distinguishes between five distinct child–parent visitor typologies: Explorer Pair, Story-Seeker Pair, Quiet Learner Pair, Active Duo and Memory-Oriented Pair. Each type exhibits specific spatial behaviours, ranging from tactile roaming to emotional dialogue, and requires tailored design interventions to sustain engagement. For example, Explorer Pairs benefit from open-ended garden paths that encourage free exploration, whereas Memory-Oriented Pairs are drawn to symbolic elements, such as ancestral altars and threshold transitions, which evoke memories and facilitate intergenerational dialogue.

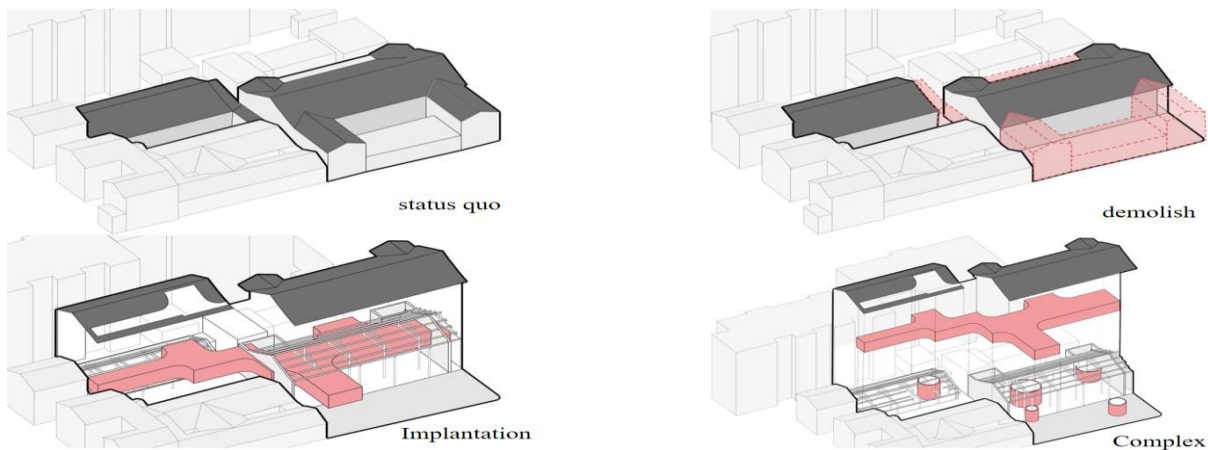
**Table 5.** Behavioral mapping matrix for child–parent visitor typologies

Visitor Typology	Spatial Preference	Key Behaviors	Design Implications
Explorer Pair	Garden paths, rooftop terrace	Roaming, tactile engagement	Create open-ended routes and sensory zones
Story-Seeker Pair	Theater room, themed chambers	Listening, role-play, symbolic talk	Use narrative triggers and symbolic décor
Quiet Learner Pair	Library, shaded alcoves	Reading, sitting, low-noise observing	Provide cozy, acoustically soft corners
Active Duo	Studio space, courtyard	Drawing, movement, verbal discussion	Include flexible, interactive surfaces
Memory-Oriented Pair	Entry thresholds, ancestral altar	Recollection, emotional dialogue	Retain symbolic artifacts and cues

The application of behavioural ethnography is in line with the increasing focus on stakeholder-responsive heritage design, particularly at sites of contention or underuse. Liu, Jin and Dupre (2022) emphasise the importance of inclusive stakeholder engagement in mediating heritage planning conflicts in transitional urban areas. Our findings support this principle by engaging diverse community members, including children, families, and heritage officers, in the early stages of spatial decision-making. Furthermore, Lou, Lee and Lim (2022) advocate stakeholder preference mapping to clarify power-interest relationships. Our approach builds on this by incorporating affective and behavioural mappings based on real-time ethnographic data. Drawing upon traditional planning methods, this study also adopts Christou, Timothy and Pericleous's (2024) experiential heritage engagement framework, which emphasises embodied interaction, emotional immersion and the design of meaningful environments. Together, these findings support an inclusive, behaviour-informed design strategy that bridges participatory heritage conservation with the daily needs of users.

## RESULTS

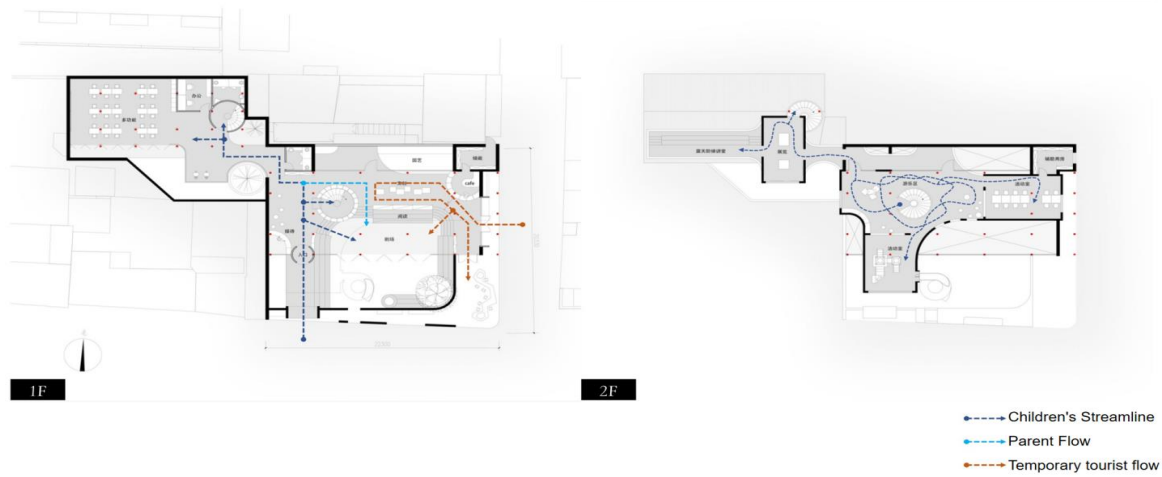
### Functional Adaptation with Heritage Sensitivity



**Figure 5.** Solution Generation Process

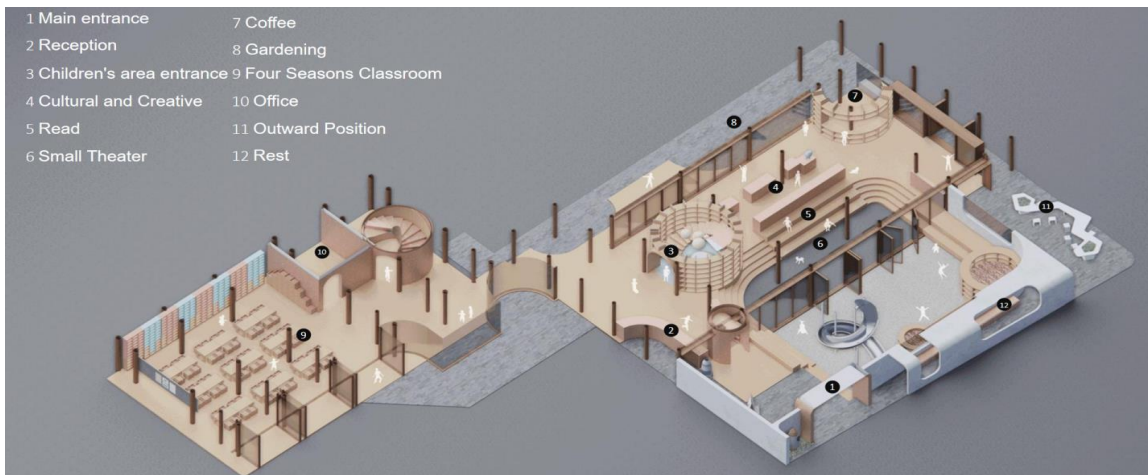
The adaptive reuse strategy at Pan Residence is an exemplar of layered integration, combining functional modernisation with heritage sensitivity. Without altering the core courtyard structure, four programmes were introduced to meet contemporary cultural and community needs: a children's library with tactile engagement features; a Kunqu micro-theatre utilising immersive soundscapes; creative studio classrooms for intergenerational learning; and a garden café with rooftop performance capacity. These programme insertions were carefully developed through a four-scenario design generation process involving the status quo, demolition, implantation and complex hybridisation (Figure 5). Rather than pursuing demolition or purely additive solutions, the final design adopted a 'complex implantation' approach that maintained the heritage framework while inserting functional spatial cores. This design approach is in line with current discourse on adaptive reuse, whereby heritage buildings are reimagined to accommodate dynamic functions without compromising authenticity (Conejos, Chew & Yung, 2017).

The broader challenge of reconciling a contemporary programme with preservation is addressed through the following design philosophy, which is evident in the complex nature of the site and all its layers of density and functionality. There must be an emphasis on shaping form and uses, and on the tactical repurposing of space, in order to balance efficient urbanity with heritage (Wang, Zhang, Wang & Dong, 2023). At Pan Residence, this was achieved through age- and use-intensity zoning programmes. Children's and parents' visitor flows were mapped separately and overlaid with temporary tourist circuits to avoid congestion while maintaining a clear perception of the occupied space (Figure 6). Subsequent flow line analysis, informed by user data, guaranteed an experience of the space that could adapt flexibly in response to changing cultural demands without compromising essential heritage thresholds. Underpinned by behavioural mapping and flow simulations, functional zoning enables differentiated experiences and mitigates the erosion of symbolic meaning in over-programmed heritage conversions.

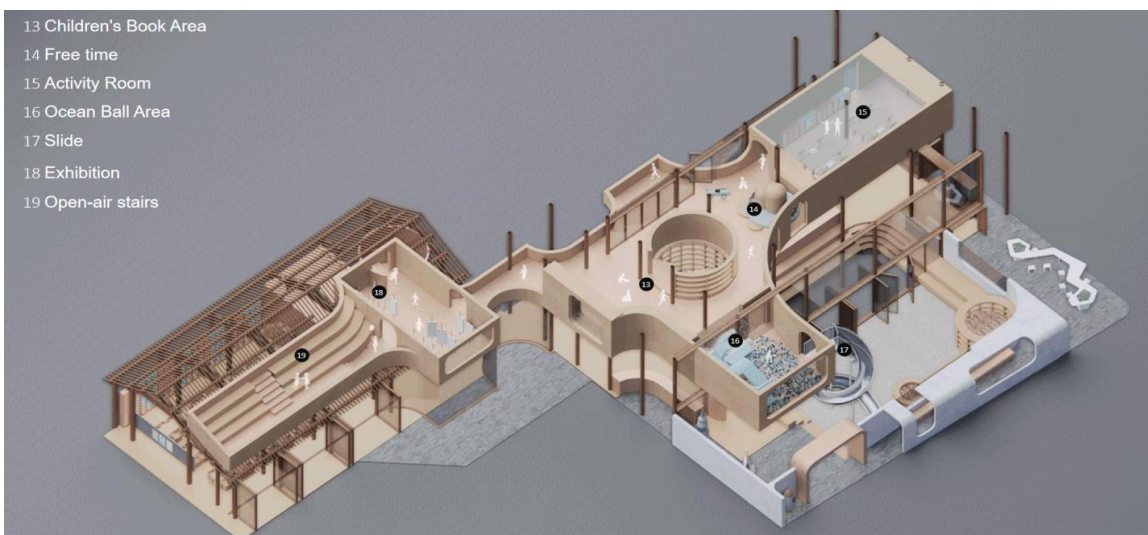


**Figure 6.** Flow line analysis diagram of the 1F and 2F

Figures 7a and 7b further articulate the architectural resolution, visualising the reuse and renovation plan across the ground and upper floors. The ground floor is dedicated to public programmes, including a reading zone, a cultural-creative hub and a small theatre which operates as a Kunqu micro-stage. This space uses immersive sound and lighting effects to enhance the transmission of cultural memory. The upper floor is devoted to child-centred experiences, such as an activity room with a slide, an ocean ball area and an interactive children's book zone. These are accessed via open-air stairs and fluid vertical circulation. This spatial arrangement reflects the VR-enhanced layering strategies suggested by Zhang, Shi, and Gu (2025), in which digital preservation tools inform spatial storytelling and architectural programming is enriched by immersive cues and experiential layering.



**Figure 7a.** Adaptive reuse plan – Ground floor



**Figure 7b.** Vertical circulation and second floor programming**Figure 7.** Reuse and renovation plan of the interior 1F and 2F

The design therefore reflects a paradigm shift in adaptive heritage architecture, moving from static preservation to immersive transformation. As Ma and Roosli (2025) suggest, dynamic adaptation based on functional development is essential for maintaining the relevance of intangible heritage in response to changing societal demands. Similarly, Radziejowska and Wieja (2025) emphasise the importance of preserving spatial characteristics when assigning new functions to underground heritage sites — an approach that aligns with the reprogramming of the Pan Residence. Rather than erasing its vernacular memory, the interior rendering (Figure 8) showcases how intergenerational engagement is fostered through spatial storytelling. Children interact with tactile books, parents converse in tiered seating and symbolic thresholds, such as circular altars and timber beams, remain visually and structurally legible. This project demonstrates how cultural resilience can be nurtured through functional integration, where architecture becomes a vessel and a medium for memory, adaptability and public relevance.



Figure 8. Interior renderings

### Material Strategy and Tactile Resonance

The renovation of the Pan Residence is an example of a layered approach to material selection, prioritising sensory resonance and heritage legibility. A deliberate palette comprising rammed earth, elm wood, terrazzo and bamboo was selected for its historical and symbolic associations, as well as its ability to create tactile continuity between past and present. Rammed earth and elm wood provide foundational textures: one grounding the space with rural authenticity, and the other offering soft-grained warmth and structural familiarity in the form of window frames and altars. These materials were arranged to evoke a tactile memoryscape that aligns with the vernacular aesthetics of traditional joinery (Heinemann et al., 2012; Cao et al., 2024). Terrazzo introduced a mid-century layer of modernity with its cool, speckled texture underfoot, bridging the gap between traditional and transitional materials. Bamboo, a lightweight yet resilient material, was used to enhance ceiling articulation and children's interaction zones. It resonates with East Asian symbolism and visual permeability (Al-Saffar & Younis, 2023). Importantly, these material choices were guided by the principles of reversibility and legibility, ensuring that new interventions did not obscure original heritage elements. The detailing in the joinery, especially at the intersections of old and new, was crafted to communicate continuity without imitation. This approach fosters the digital-era material ethics described by Ruan et al. (2009): a balance between preservation, augmentation, and sensory engagement. As shown in Table 6, the diverse tactile effects — granular, resilient, smooth and familiar — were carefully mapped onto functional zones to support cognitive orientation and physical comfort, particularly for intergenerational visitors.

**Table 6.** Material palette and tactile surfaces strategy

Material	Historical Value	Tactile Effect	Design Application
Rammed Earth	Traditional rural texture	Warm, granular	Wall infill in courtyard edges, grounding authenticity
Elm Wood	Vernacular joinery	Soft grain, familiar warmth	Window frames, reading nooks, altars
Terrazzo	Mid-century heritage	Cool, speckled, smooth underfoot	Public flooring, transitional thresholds

Bamboo	East Asian symbolism	Light, textured, resilient	Screens, decorative ceilings, children’s railings
Rubber Flooring	Contemporary safety layer	Soft, bounce-back, muted acoustics	Child library, stair landings, sensory zones
Textured Paint	Modern reinterpretation	Matte, visually soothing	Accent walls and immersive chambers

This material strategy responds not only to aesthetic considerations, but also to administrative and cultural imperatives related to non-material heritage values and embodied practices (Xie & Li, 2013). Rather than preserving materials as static relics, the renovation project uses them to actively mediate memory and movement. By incorporating sensory cues into wall infills, reading nooks and transitional spaces, the renovation encourages interactions that align with the psychological principles of heritage tourism and sensory design (Cao et al., 2024). For instance, the tactile roughness of the rammed earth at the edges of the courtyard not only lends authenticity, but also encourages intergenerational interaction through direct contact, reflecting calls for experiential preservation strategies in the context of modernisation pressures (Heinemann et al., 2012). In summary, the Pan Residence renovation shows that, when thoughtfully orchestrated, materiality can be both a conservation tool and a communicative medium. Through the interplay of tactility, memory, and reversibility, the design affirms that heritage value is sensory, experiential, and narrative — an evolving interface between users and place.

**Immersive Experience Design**

The experiential design of the Pan Residence renovation was guided by spatial dramaturgy, with Kunqu theatrical structures forming the basis of the design. Each spatial node aligns with an emotional transition in the visitor journey. The aim of the design was to evoke sensory resonance and cultural recall through the use of symbolic materials, modulated lighting and ambient soundscapes. Translucent thresholds, for instance, were strategically placed to enhance narrative transitions between stages, while dynamic light and shadow effects modulated the emotional tone along the way. A key spatial element was the 'Rebirth Room', which functioned as both a contemplative chamber and an interactive play zone for younger visitors, embodying the fusion of memory and imagination. As outlined in Table 7, the visitor's sequential experience progressed from orientation at the ceremonial entry gate to a tranquil farewell in the tea pavilion. Each stage — arrival, immersion, engagement, interaction, climax and closure — was designed with the specific intent of transitioning the user from exploration to emotional reflection and symbolic elevation. This dramaturgical arc mirrors recent models of immersive heritage journeys that emphasise affective depth, symbolic staging and co-creative participation (Bec et al., 2019; Rogers et al., 2018).

**Table 7.** Visitor journey showing experiential sequence

Stage	Spatial Node	Experience Type	Design Intent
Arrival	Front Courtyard & Entry Gate	Orientation & Transition	Framed entry, ceremonial threshold, sensory cues
Immersion	Garden Pathways	Exploratory Strolling	Winding circulation, layered sightlines
Engagement	Kunqu Theater & Reading Room	Performance & Reflection	Embodied narrative immersion and knowledge recall
Interaction	Creative Studio & Workshop	Participation & Play	Child–parent co-creation, flexible educational use
Climax	Rooftop Platform	Panoramic View & Release	Spatial culmination, visual openness, symbolic elevation
Closure	Tea Pavilion & Exit Path	Tranquility & Farewell	Ritual calm, soft lighting, emotional closure

This multi-sensory staging strategy draws on research into immersive tourism and XR-based heritage education. Studies confirm that immersive environments, particularly those incorporating ambient sound, layered sightlines and participatory cues, significantly enhance user motivation, memory and engagement with heritage values (Tufail et al., 2022; Anwar et al., 2025). The Pan Residence framework reflects this logic by orchestrating symbolic encounters through embodied nodes, such as the 'Creative Studio', where intergenerational co-creation can occur, and the rooftop climax platform, which offers panoramic views. These spatial devices align with cognitive-affective models of XR cultural learning environments (Anwar et al., 2025) and are consistent with visitor-centred management strategies for fostering memorable heritage engagement (Bec et al., 2019).

Furthermore, virtual heritage studies emphasise the importance of dramaturgical pacing, lighting, atmosphere and sensory symbolism in producing an authentic experience (Rogers et al., 2018). In natural heritage contexts, low-cost immersive strategies have also demonstrated the ability to enhance perceived site value and encourage reflection among users (Pervolarakis et al., 2022), which supports Pan Residence's synthesis of cost-efficient yet symbolically potent design. Overall, the visitor experience at the Pan Residence was not merely structured to inform, but to invoke layered experiential states — orientational, performative and affective — through carefully orchestrated immersive design.

## DISCUSSION

### Narrative-Centered Reuse and Cultural Authorship

The adaptive reuse of the Pan Residence exemplifies a paradigm shift in conservation, moving from a fabric-centric approach to a meaning-driven framework that prioritises spatial storytelling and symbolic continuity. Rather than treating architectural surfaces as passive carriers of historical fabric, this approach fosters 'cultural authorship', in which the reinterpretation of spaces becomes a participatory and localised act, grounded in collective memory and ritual. This strategy is similar to examples seen internationally, such as Paris's Maison des Métallos and Barcelona's Casa Bloc, where heritage reuse is less about preserving material authenticity and more about activating civic narratives through spatial interventions. This narrative-centred reuse approach fosters cultural dialogue while retaining symbolic depth, enabling new generations to imprint their meanings onto heritage settings without obliterating foundational identities.

This reorientation is consistent with broader trends identified in recent academic research. Zhang and Zhang (2023) emphasise the importance of developing post-evaluation frameworks that assess adaptive reuse interventions based not only on fabric retention, but also on policy relevance, spatial clarity and symbolic value. Their study of Beijing's central axis highlights how spatial characteristics and ritual cues can inform reuse strategies that go beyond material preservation. In a complementary European context, Van Knippenberg and Boonstra (2023) propose a co-evolutionary model of heritage reuse which recognises that meaning is shaped by the ongoing interaction between communities, institutions and spatial memory. Their analysis reveals that heritage projects succeed not solely through architectural fidelity, but by enabling interpretive authorship through plural voices. Furthermore, in their case study of Warsaw's Praga district, van Knippenberg and Boonstra (2024) argue that tensions between aesthetic form and ethical community representation can be negotiated through narrative layering and symbolic reinterpretation. Together, these perspectives affirm that, in complex urban contexts such as Shanghai, cultural authorship through spatial narrative — rather than rigid material conservation — offers a resilient, socially embedded pathway for immersive heritage transformation.

### Heritage Pedagogy for Intergenerational Engagement

The spatial design of the Pan Residence uses dramaturgical architecture to create an immersive heritage pedagogy that goes beyond traditional didactic methods. The sequence of thematic rooms, ambient lighting and multisensory cues, such as curated soundscapes and dynamic spatial thresholds, creates an environment in which children are emotionally engaged co-participants, rather than passive recipients of historical content. This approach is aligned with the concept of embodied heritage learning, where cognitive understanding is enhanced through sensory interaction and physical movement within narrative spaces. The spatial dramaturgy structures the experience around emotional climax and resolution, supporting a layered educational encounter which is particularly effective for young visitors. As Kelsey and Roberts (2010) observe in their case study of Bath, intergenerational engagement is crucial for ensuring the long-term sustainability of cultural practices, particularly when heritage education incorporates participatory processes that bridge generational divides. Their findings emphasise how community heritage practices become more resilient when children are meaningfully involved in cultural transmission activities.

**Table 8.** Comparative narrative-driven reuse strategies

City	Project Site	Narrative Approach	Key Mediums	Target Audience	Design Intent
Shanghai	Pan Residence	Kunqu-inspired dramaturgy	Spatial sequencing, symbolic rooms	Children & families	Child-friendly cultural storytelling
Kyoto	Machiya Theater District	Performative reactivation of traditions	Community theater, local tales	Tourists & residents	Slow heritage tourism with narrative anchors

Venice	Ca' Foscari Cultural Cluster	Historical layering as living archive	Audio-guides, curated vignettes	General public	Reveal temporal depth and urban palimpsest
Montreal	Pointe-à-Callière Archaeological Museum	Immersive historical simulation	Digital projection, multisensory space	Students & families	Educational immersion via experiential design

The approach is not only anchored in architectural design, but also in broader trends that highlight the importance of heritage-based intergenerational learning. The need for culturally rooted educational continuity in Japan was emphasised by the impact of the pandemic, and heritage policies have since prioritised youth-targeted engagement strategies (Yamada et al., 2024). By raising awareness of heritage in younger generations through immersive and emotionally resonant environments, institutions can respond effectively to calls for long- and short-term resilience. Furthermore, integrating interactive digital tools and smart environments, as demonstrated by Amaro and Oliveira (2019), supports playful learning experiences that blend storytelling with tangible interaction. Their work shows how smart objects and sensory-rich installations in rural heritage contexts can successfully foster intergenerational dialogue and knowledge co-creation. At Pan Residence, these pedagogical principles are applied in physical form: the Rebirth Room, for example, serves as an interpretive space and a reflective play area, enabling children to interact with cultural themes through movement, discovery and emotional connection. This design conveys knowledge and generates a lasting sense of ownership, encouraging children to see themselves as part of the cultural continuum. This fusion of immersive space and educational intent reflects a broader shift in perception of heritage, from viewing it as a static artefact to viewing it as an active learning experience.

### Ethics of Theatricality and Authenticity

The immersive design of the Pan Residence renovation employed a dramaturgical approach, carefully negotiating the balance between theatrical enhancement and ethical preservation. To ensure the transformation respected cultural integrity while fostering spatial storytelling, three core principles were implemented: the reversibility of architectural interventions; the layered legibility of historical elements; and the preservation of symbolic components, such as ancestral altars and entry screens. These principles reflect an emerging ethics of heritage curation that parallels the ethical discourse in disciplines such as nursing, where preserving identity and continuity are key concerns. Fowler (2016) advocates a 'heritage ethics' framework that recognises layered historical identities and the necessity of moral accountability when representing institutional legacies. When applied to architectural heritage, this perspective highlights the importance of reversible design choices that enable future generations to reinterpret or restore heritage without causing permanent damage. At the Pan Residence, the spatial additions were intentionally minimal and removable to ensure that the visitor's theatrical journey never compromised the integrity of the building.

Another cornerstone of this ethical stance was layered legibility, which ensured that historical elements were not simply concealed or aestheticised, but retained within a readable, contextual hierarchy. This aligns with the caution raised by Fowler (2017), who emphasises the risk of erasing ethical lineages when disciplinary histories are reduced to superficial narratives. In Pan Residence, restored surfaces were juxtaposed with interpretive overlays, such as translucent partitions or elevated walkways, to enable a multi-temporal interpretation of the space. The aim was to strike a balance between aesthetic immersion and pedagogical depth, akin to the ethical tension examined by Stam et al. (2013), who investigated how religious heritage influences long-term societal values in the face of modernisation. Their findings on 'layered adherence' to values are relevant to the conservation strategy employed here, whereby symbolic elements such as family shrines and screen thresholds were retained not just for visual memory, but also to invoke deeper cultural scripts and moral anchors. This theatrical-authentic hybridisation did not aim to reconstruct the past, but rather to sustain its ethical intelligibility and participatory relevance for contemporary audiences.

## CONCLUSION

### Summary of Contributions

This study introduces a spatial poetics framework tailored for the reuse of domestic heritage, offering an integrative perspective that reimagines micro-heritage through architectural reversibility, layered legibility and symbolic preservation. Building upon previous research in brand heritage (Cooper et al., 2015), which emphasised the recovery of meaning through storytelling and value restoration, the spatial poetics framework also anchors interpretation in narrative and material integrity. However, unlike in the realm of corporate

branding, the Pan Residence case demonstrates how domestic heritage reuse can be spatially and sensorially scripted to evoke cultural continuity without rigid musealisation. Unlike Tawab's (2013) focus on the material authenticity of earthen heritage in Egypt, this framework broadens the concept of authenticity to encompass experiential and performative aspects, particularly where symbolic fixtures such as family altars and entry screens preserve intangible values beyond physical preservation.

Another key contribution is demonstrating child-centred programming within an urban micro-heritage site, which is an often overlooked demographic in heritage interpretation. Through adaptive reuse strategies prioritising accessibility, narrative engagement and intergenerational learning, the project reimagines heritage as pedagogical and participatory. This aligns with Abunie et al.'s (2024) assertion that sustainable heritage conservation should extend beyond material protection to meaningfully engage local stakeholders, including younger audiences. Furthermore, the programming at the Pan Residence reflects the findings of Liu (2017), who emphasised that community involvement is crucial not only in heritage governance, but also in ensuring its lived relevance and continuity. By incorporating local crafts, oral history and educational play, the Pan Residence aligns interpretive reuse with spatial design and social activation.

Finally, this paper puts forward a new model of interpretive reuse, balancing story, material and community. It acknowledges that heritage is an evolving narrative, shaped by competing values and institutional frameworks. This concept is discussed by Jing (2017) in her legal discourse analysis of heritage conceptualisation. Instead of separating tangible and intangible heritage values, the spatial poetics model combines them through dramaturgical design, community storytelling and ritual preservation. It positions interpretive reuse to negotiate authenticity as a dialogic process responsive to present community identities and futures, not only as fidelity to the past. Together, these contributions offer a scalable, human-centred approach to heritage reuse in dense urban contexts.

### Practice and Policy Implications

Exploring narrative architecture as a strategic design philosophy has powerful implications for heritage-based experiential learning. By embedding stories within physical spaces, narrative architecture can transform static heritage buildings into dynamic learning environments where public understanding of cultural identity is deepened through embodied engagement (Jie & Mohamed, 2023). This is particularly relevant in adaptive reuse contexts, where architectural interventions must balance contemporary utility with historical integrity. Participatory co-design processes, particularly those involving children, demonstrate potential for the community-led activation of micro-heritage, as evidenced by comparable Malaysian initiatives that emphasise grassroots involvement and social sustainability (Zahari, Che-Ani & Amat, 2020). Co-creation fosters a sense of ownership and promotes intergenerational continuity in heritage appreciation, reflecting broader inclusive design strategies in culturally significant spaces (Nor & Zahid, 2016).

Cultural dramaturgy, as applied in the renovation of the Pan Residence, enables historical elements to be reinterpreted without compromising authenticity. This approach is consistent with research on the digital and physical preservation of intangible heritage, in which storytelling, whether through narrative architecture or knowledge systems, supports the transmission of memory across generations (Isa et al., 2019). At the policy level, such poetic approaches to space complement international best practices that link heritage conservation with place-based identity and environmental objectives (Judson, Iyer-Raniga & Horne, 2014). Furthermore, integrating local narratives into reuse projects is consistent with the demand for culturally sensitive conservation policies that address the tangible and intangible aspects of heritage (Amar, Armitage & O'Hare, 2017). Ultimately, immersive heritage frameworks offer a model of practice that is enriched by narrative, material and community elements, and which advances policy development and educational engagement across diverse cultural contexts.

### LIMITATIONS AND FUTURE WORK

Despite offering a novel framework for immersive spatial poetics in heritage renovation, this study has several limitations. Notably, no post-occupancy environmental or behavioural data was collected after the Pan Residence was transformed. Consequently, we cannot evaluate the impact of spatial interventions on visitor experience over time. Furthermore, the absence of quantitative environmental metrics, such as daylight factor, ventilation quality and acoustic performance, limits the robustness of our design assessment. Such technical criteria have been shown to be essential for evaluating the adaptive reuse of heritage architecture, particularly in Southeast Asian contexts (Broughton et al., 2023). Similarly, museum-based studies emphasise that user experience within heritage spaces is closely linked to spatial ambience and visitor engagement, both of which require rigorous empirical validation (Yaaco & Harun, 2025). Additionally, the absence of comparative data

across different visitor demographics and usage patterns prevents the development of generalised insights regarding behaviour-based spatial optimisation.

Future research should prioritise longitudinal behavioural analysis across diverse visitor typologies, such as children, elderly users and cultural tourists, to determine how spatial poetics and interpretive design are experienced differently over time. To enhance the analytical rigour of spatial reuse, future studies should incorporate sensor-based data collection and post-occupancy evaluation, thereby aligning with the best practices of heritage and museum planning (Yaaco & Harun, 2025). Furthermore, while this research primarily focused on a Sinitic urban typology, subsequent applications of the proposed spatial poetics framework could examine its suitability for non-Sinitic domestic environments, such as Moroccan riads, Turkish konaks and Indian havelis. This comparative approach would help to assess whether layered legibility and symbolic preservation resonate across different cultural architectures. Prior literature on heritage cities emphasises the importance of culturally grounded spatial narratives in shaping identity and urban revitalisation (Selamat et al., 2024). Additionally, the rich symbolic and climatic adaptations embedded within traditional forms, such as the passive cooling strategies in Malay heritage houses, could offer valuable cross-cultural design insights when transferred to other climatic zones and historical narratives (Broughton et al., 2023). Ultimately, future work should aim to expand the spatial poetics model into a scalable, data-driven toolkit applicable to different heritage typologies and geographical regions.

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