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Wekalet Bazaraa as Spatial Intelligence: Reviving Vernacular Market Design for a Resilient Future in Cairo

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Wekalet bazaraa as spatial intelligence: reviving vernacular market design for a resilient future in Cairo

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Abstract

Purpose

This paper operationalizes spatial intelligence as a multi-lens analytical framework for reading vernacular market architecture as a coordinated system. The framework is applied to Wekalet Bazaraa, a historic market-lodging complex in Cairo, to extract transferable design principles for contemporary retail environments in hot-climate contexts.

Design/methodology/approach

The study draws from literature, archival sources, and first-hand spatial documentation. Six interdependent analytical lenses structure the case analysis, followed by synthesis into design principles. The method is replicable across comparable market typologies.

Findings

The framework establishes spatial intelligence as a coordinated architectural system that can be read through multiple lenses. Applied to Wekalet Bazaraa, it reveals how spatial hierarchy, thresholds, proportion, material and structural economy, environmental modulation, and temporal adaptability operate together to support comfort, adaptability, and long-term resilience. These findings inform transferable design principles for contemporary retail environments.

Originality/value

The paper's contribution lies in establishing spatial intelligence as an operational analytical framework for systematically translating vernacular market architecture into transferable design knowledge for resilient retail environments in the Global South and beyond.

Keywords

Spatial intelligence, Analytical Framework, Vernacular Market Architecture, Traditional Marketplaces, Retail Architecture, Wekalet Bazaraa.

1. Introduction

In recent decades, commercial architecture in Egypt, as in many cities around the world, has grown increasingly detached from context. Shopping malls, glass-fronted retail strips, and stand-alone commercial buildings often follow generic, imported models that neglect the climate, culture, and rhythms of everyday life. Youssef (2021, p. 97) describes contemporary shopping malls in Egypt as “representations of the globalized economy” that prioritise spectacle and consumption. These environments are typically climate-controlled and simulate a version

of public life that is separated from the city. Scholars have described this shift as a form of urban satellization, where the mall becomes a self-contained city of its own (Baudrillard, 1994; Clarke, 2003; Miles, 2012). The street, the square, and the market are recreated under one roof, placing shopping into privatized, consumer-driven containers (Abaza, 2001; Youssef, 2021).

By contrast, Cairo's historic market evolved through centuries of spatial adaptation. Having long shaped the daily life of the city, these commercial spaces carry layers of cultural, social, and environmental intelligence. They functioned as integrated urban systems in which spatial configuration, proportion, material use, and environmental responsiveness were calibrated to support everyday life.

While vernacular markets in Islamic and Global South contexts have been extensively documented, much of this work remains descriptive or historical in focus (Moosavi et al., 2025). Fewer studies employ architectural frameworks capable of extracting spatial intelligence for contemporary retail under climatic and social stress. Revisiting embedded spatial intelligence offers a basis for more adaptive commercial architecture.

Spatial intelligence here is understood not as stylistic heritage nor isolated configuration, but as the capacity of architectural form to coordinate proportion, environmental modulation, material economy, adaptability, and spatial hierarchy into a coherent system. While existing approaches such as space syntax and sustainability models illuminate important dimensions of spatial quality, they tend to treat these as distinct analytical fields. The position advanced here treats them as interdependent aspects of architectural form operating within one system.

While spatial intelligence is understood as a general architectural capacity, its operationalization is calibrated to vernacular market architecture, where spatial hierarchy, thresholds, material economy, and temporal adaptability are particularly pronounced. Markets therefore function as a critical typological context for testing and refining the framework.

This framework is applied to Wekalet Bazaraa, an understudied but well-preserved vernacular market-lodging complex within Cairo's historic centre, to foreground its dormant spatial intelligence. Previous work on comparable complexes, such as Wekalet al-Ghuri, has shown how thick walls, shaded passages, and courtyard organization support passive comfort and programmatic versatility (Fahmy et al., 2019). Aalund (1978) ranks Wekalet Bazaraa as one of the best-preserved examples of its type. While largely abandoned today, archival sources document successive phases of use and adaptation, allowing the building to be read as a spatial system designed to accommodate temporal change. Its irregular plan, shared walls, and layered functional history reflect a logic of adaptation relevant to contemporary sustainable retail design.

Throughout this research, the term resilience represents the capacity of architectural form to accommodate environmental stress and changing patterns of use over time without losing spatial coherence nor functional clarity.

This research aligns most closely with the thematic area of **Environmental Change: Architecture and Urban Morphogenesis toward More Nature-Integrated Environments**. By demonstrating how vernacular markets developed forms that adapted over time to climate, density, and use through spatial, material, and environmental calibration rather than mechanical intervention, the paper contributes to rethinking future retail environments that operate with environmental forces and urban conditions rather than against them.

The following sections discuss the theoretical grounding of spatial intelligence, review previous studies on Cairo's *wekalas*, and present an architectural analysis of Wekalet Bazaraa as a case study. By translating these findings into adaptable design principles, the paper contributes to ongoing discussions of resilient, user-centred, and culturally grounded retail environments globally, bridging historical intelligence with contemporary application.

2. Literature Review

This section establishes a theoretical framework for understanding spatial intelligence as an architectural capacity, positions vernacular markets as carriers of embedded design knowledge, and situates Wekalet Bazaraa within existing scholarship.

2.1. Spatial Intelligence and Relational Space in Architectural Discourse

Architectural theory has long treated space as an operative and relational system that structures movement, social interaction, and environmental performance. This position is foundational to space syntax and configurational theories, particularly Hillier and Hanson (1984), who demonstrate that architectural form operates through spatial relationships as a system rather than isolated elements.

The term spatial intelligence has been used across architectural discourse in multiple ways. Van Schaik (2008) frames it as a practice-based, embodied capacity developed through design experience, while De Kerckhove (1995) approaches it through the cognitive and perceptual effects of environments.

This study positions spatial intelligence as an analytical descriptor of what a building embodies and performs as a coordinated system. In this sense, intelligence is legible in form, emerging through the interaction of spatial hierarchy and organization, thresholds and transitions, proportion and spatial rhythm, material and structural economy, environmental modulation, and temporal adaptability. Unlike spatial qualities or logics, which may be analysed in isolation, spatial intelligence is not reducible to any single attribute but arises only through their relational coordination within the architectural system.

Relational and performative theories frame architecture as operating through time, use, and adaptation (Davidová, 2017). Relational space, specifically, refers to spatial qualities that emerge through the interaction of form, movement, and social practice rather than through isolated formal attributes, an understanding examined across architectural and sociological discourse (Bartmanski & Weidenhaus, 2023) and one that directly informs the multi-lens framework developed in this study.

In parallel, Peponis expanded on Hillier and Hanson's work by refining how architectural effects emerge from spatial form itself. They argue that spatial experience and behaviour are shaped by how spaces are connected, sequenced, and proportioned, rather than by isolated attributes. Empirical studies have repeatedly demonstrated correlations between spatial configuration and observed patterns of movement and co-presence, reinforcing the idea that space actively structures behaviour (Hillier, 1996; Peponis et al., 1997). This is further supported by research in cognitive science, confirming that spatial organization shapes behaviour and

perception (Uttal et al., 2013; Chen et al., 2020), though such findings are rarely integrated into architectural analysis beyond isolated performance metrics.

Together, these works show that spatial quality has been theorized across formal, experiential, behavioural, and environmental perspectives, largely in isolation. The division of architectural discourse into these parallel strands has resulted in fragmented understandings of spatial intelligence, with no single framework fully accounting for how these dimensions interact within architectural form (Moulaert et al., 2013; Moosavi et al., 2025).

Spatial intelligence, as developed in this study, becomes legible through six interrelated dimensions of architectural form: spatial hierarchy and organization, proportion and spatial rhythm, thresholds and transitions, material and structural economy, environmental and climatic performance, and temporal adaptability. These dimensions are not independent categories but aspects of a relational system, each shaping the others.

2.2. Limits of Existing Integrative Frameworks in Architectural Analysis

This fragmentation has prompted recent efforts to develop integrated frameworks for reading spatial quality and intelligence (e.g. Khan et al., 2014; Moulaert et al., 2013). Among these, Khan et al. (2014) advance a framework that integrates formal, social, environmental, and ethical dimensions at the scale of urban design and planning, proposing a relational epistemology through which spatial quality is understood as a multi-dimensional condition. While such frameworks successfully synthesize multiple dimensions, they remain largely epistemological and policy-oriented, leaving a gap for architectural methods that operate directly at the scale of form, where spatial, environmental, and temporal dimensions are read as coordinated within the built system. Existing approaches analyse spatial configuration quantitatively or interpret cultural and environmental dimensions qualitatively but rarely provide a unified method for reading how these dimensions interact within architectural form.

Moreover, temporality within these frameworks is often treated as an external process acting upon space, rather than as an architectural capacity structured through form to enable continuity, adaptability, and repair (Galan et al., 2020).

The absence of architectural methods capable of coordinating spatial, material, environmental, ethical, and temporal dimensions into a unified reading leaves a critical gap in the literature. This study responds to that gap not only by applying spatial intelligence as an analytical tool to a vernacular market case, but by contributing to the discourse on spatial intelligence itself, demonstrating that it operates as a readable and transferable property of architectural form rather than solely as a cognitive or experiential capacity.

2.3. Vernacular Architecture as Embedded Spatial Intelligence

Vernacular spatial form is understood to encode social structures, environmental adaptation, and cultural practices developed through long-term use rather than formal design intent (Hourigan, 2006; Pardo, 2023). In this sense, spatial layouts, proportions, thresholds, and hierarchies operate as carriers of intelligence embedded in built form and everyday practice (Wu et al., 2025; Al-Jokhadar & Jabi, 2019).

Temporal adaptability is often acknowledged conceptually and descriptively through lifecycle-based evaluations that document changes across planning, construction, use, and upgrading. However, it is rarely examined through longitudinal or comparative studies that track spatial transformation over time (Galan et al., 2020). This highlights the need for a consistent approach that translates temporal change into spatial logic within the vernacular context.

Moreover, certain regions and building types remain underrepresented, which limits the transferability of extracted principles (Wu et al., 2025). Most of the existing studies are applied to housing or generic vernacular settlements. Existing approaches struggle to read spatial intelligence as a coordinated interaction between spatial configuration, proportion, material logic, structural economy, environmental performance, social practice, and time (Moosavi et al., 2025).

2.4. Traditional Markets and the Partial Reading of Spatial Intelligence

Traditional markets provide a particularly rich context for examining embedded spatial intelligence, as they integrate economic activity, social interaction, and environmental regulation within a single architectural system. Rather than functioning as isolated buildings, markets historically operated as coordinated spatial structures in which circulation, hierarchy, material use, and climate moderation were calibrated to everyday life.

In Islamic cities, as well, markets were not merely sites of exchange but central spatial organizers within the urban fabric. Historical and urban studies show that commercial structures were shaped by specialization, circulation patterns, and proximity to civic and religious institutions, forming integrated socio-spatial systems (Raymond and Wiet, 1979; Hanna, 1981). Moussa (2026) further challenges mosque-centered readings of Islamic urbanism by arguing that commerce often functioned as an urban generator, producing dense and interconnected microcosms through repeated spatial patterns of trade, storage, and dwelling.

Scholars have documented the scale and importance of this typology in Cairo. Raymond and Wiet, (1979) record over 300 *wekalas* constructed during the Ottoman period, underscoring their economic and spatial centrality. Hanna (1981) demonstrates how many operated within *waqf* systems, linking commercial revenue to the maintenance of religious, educational, and civic institutions. Moussa (2026) further characterizes the *wekala* as an architectural expression of its society, where economic function, ethical obligation, and civic responsibility intersected within built form.

Despite this extensive body of scholarship, existing studies tend to address traditional markets through partial analytical lenses. Spatial organization is often examined through configurational analysis, network mapping, or urban morphology, focusing on connectivity, hierarchy, and accessibility. Environmental performance is typically treated as a separate concern, while social, ethical, and temporal dimensions are discussed descriptively or historically rather than as architectural capacities.

As a result, traditional markets are rarely examined through a coordinated architectural framework capable of reading how spatial hierarchy, proportional logics, thresholds and transitions, material economy, environmental performance, and temporal adaptability operate together

within a single system. While markets are widely recognized as intelligent and adaptive environments, this intelligence remains analytically dispersed across separate bodies of literature.

This gap motivates a focused examination of Wekalet Bazaraa as a documented yet under-analyzed example through which spatial intelligence in vernacular market architecture can be operationally examined. As one of the most intact surviving *wekalas* in Cairo, Bazaraa offers a suitable case for testing a multi-lens architectural framework that reads embedded intelligence as a relational system rather than as isolated attributes. The following section builds on this literature by situating Wekalet Bazaraa within existing scholarship and clarifying its relevance as a case for analytical extraction.

2.5. Wekalet Bazaraa as a Case for Reading Vernacular Market Spatial Intelligence

Wekalet Bazaraa occupies a distinctive position within scholarship on Cairo's historic commercial architecture due to its layered history of reconstruction, changing use, and relative physical integrity. As with many vernacular commercial structures in Cairo, its precise date and origin remain subject to scholarly debate, reflecting both the building's long temporal span and the cumulative nature of its transformation. Moussa (2026) notes that although the *waqf* deed of Aisha Khatun dated to 1751 records an Ottoman-period reconstruction, the spatial organization of the complex retains distinct Mamluk characteristics. These include an asymmetrical layout, pronounced vertical layering with multiple upper floors, and an exterior staircase that separates residential accommodation from ground-level commercial activity. According to Moussa (2026), these characteristics suggest that the Ottoman rebuilding largely followed an earlier Mamluk spatial logic rather than introducing a fundamentally new organizational order.

Aalund (1978) similarly situates the structure, as documented in the late twentieth century, within a sequence of rebuilding phases, attributing its recorded configuration to the late seventeenth century while emphasizing the fact that successive reconstructions respected the established *wekala* typology. In his account, Wekalet Bazaraa initially served merchants from Damascus trading in woven textiles and was later reconstructed as a leather bazaar, with *waqf* revenues directed toward the support of a school (Aalund, 1978). Abdel-Aal et al. (2018), by contrast, associate the complex with wood trade activities that persisted into the nineteenth century. While these accounts differ in their emphasis on specific commodities and periods, they converge in describing the *wekala* as a commercial structure repeatedly adapted to shifting economic functions without fundamental disruption to its spatial organization.

In 1749, the complex was acquired by Aisha Khatun, who partially rebuilt it and incorporated it into her *waqf*. Prior to its nineteenth-century acquisition by the Yemeni merchant Mohamed Bazaraa and his sons, the building was known as Wekalet al-Khekhia, named after Aisha Khatun's husband, Hassan Katkhuda (Moussa, 2026). Through the *waqf* system, architecture functioned not only as a site of economic exchange but also as a form of social infrastructure. Revenues generated through trade supported mosques, schools, and public facilities, creating self-sustaining urban cycles in which private commercial activity was directly linked to collective welfare (Aalund, 1978; Hanna, 1981).

These arrangements were underpinned by ethical principles articulated through *fiqh al-imarah* and *fiqh al-muamalat*, which emphasized fairness, reciprocity, and responsibility in human dealings (Azab, 2013). Early Islamic scholars such as al-Mawardi and Ibn Abi al-Rabi framed markets as essential urban institutions whose scale and organization were to be calibrated to the needs of their communities. Markets were expected to be sufficiently large to ensure access and provision, yet restrained enough to avoid excess, waste, or social harm. Oversized markets were associated with stagnation and hoarding, while undersized ones produced scarcity and inflated prices, restricting access to essential goods. Within this discourse, proportionality functioned not merely as a practical concern, but as an ethical principle shaping economic stability and social balance over time.

This ethical orientation distinguishes vernacular market logic from contemporary retail planning approaches that prioritize maximization of profit and consumption. In the historical context of Cairo, markets were conceived as structures of sufficiency rather than excess, calibrated to sustain long-term use and equitable access. Vernacular commercial buildings that adhered to these principles were understood to protect users from harm while supporting shared benefits across generations. Within this logic, Wekalet Bazaraa can be situated as more than a site for trade, but as part of a broader system that linked commerce, governance, and civic responsibility.

Within the typology of Cairo's traditional markets, Wekalet Bazaraa is consistently identified as a mixed-use commercial structure that integrated wholesale trade, storage, and residential accommodation around a central courtyard (Aalund, 1978; Abdel-Aal et al., 2018). Its repeated documentation across architectural and historical studies positions it as a legible example of the *wekala* type, despite successive phases of reconstruction and changing economic use. Existing scholarship approaches the building primarily through typological, historical, and heritage-oriented lenses. While existing literature provides detailed documentation of Wekalet Bazaraa's form, history, and institutional context, it remains largely descriptive. The building is rarely examined through an architectural approach capable of reading how spatial hierarchy, proportion, thresholds, material economy, environmental moderation, and temporal change operate together as an integrated system.

This review therefore situates Wekalet Bazaraa within its historical, ethical, and institutional contexts as a basis for the architectural analysis that follows.

3. Methodology

This study combines literature review, secondary archival interpretation, and direct site observation to understand Wekalet Bazaraa as a living expression of vernacular intelligence. The methods employed in this study are replicable across comparable cases that exhibit spatial integrity, documented phases of adaptation, and an availability of archival and field material. The approach is interpretative, aiming to extract qualitative design knowledge. This interpretative approach aligns with established architectural research methods that employ typological reading, comparative spatial analysis, and diagrammatic representation as analytical tools for extracting spatial principles as opposed to classificatory descriptions (e.g., Vidler, 2000; Plowright, 2014).

Fig. 1 illustrates the sequence of contribution in this study, moving from the formulation of an analytical framework to its application in reading a selected vernacular market, and finally to the synthesis of transferable principles for resilient retail.

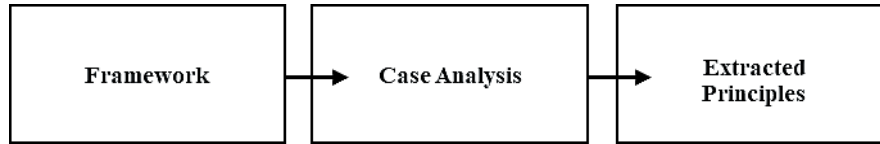


Fig. 1. Research structure linking framework development, case analysis, and principle extraction.
Source: Author's own work.

3.1 Operationalizing Spatial Intelligence as an Analytical Framework

The position adopted in this study builds on configurational theories of spatial logic and their influence on architectural performance. Spatial intelligence here understands architectural form as a coordinated system, in which spatial organization, hierarchy, proportion, rhythm, thresholds, material logic, structural economy, environmental performance, continuity, and temporal adaptability all operate in relation to one another.

This analytical reading is guided by a set of interrelated lenses derived from architectural theory and iterative reading of recurring spatial logics within the case. Spatial intelligence is operationalized in this study through the following six analytical dimensions:

1. **Spatial hierarchy and organization**
2. **Proportion and spatial rhythm**
3. **Thresholds and transitions**
4. **Material and structural economy**
5. **Environmental and climatic performance**
6. **Temporal adaptability**

These dimensions are not treated as isolated or hierarchical categories, but as interdependent aspects of a single architectural system as presented in **Fig. 2**. They are treated as analytically equivalent entry points into the system; however, their relative prominence varies depending on the specific spatial and environmental conditions of the case under study. This variability reflects how spatial intelligence operates in practice, emerging through the differential interaction of these dimensions instead of through fixed or equal weighting. Each lens serves as a mode of reading, not a discrete category, allowing multiple dimensions to be observed relationally within the same spatial condition.

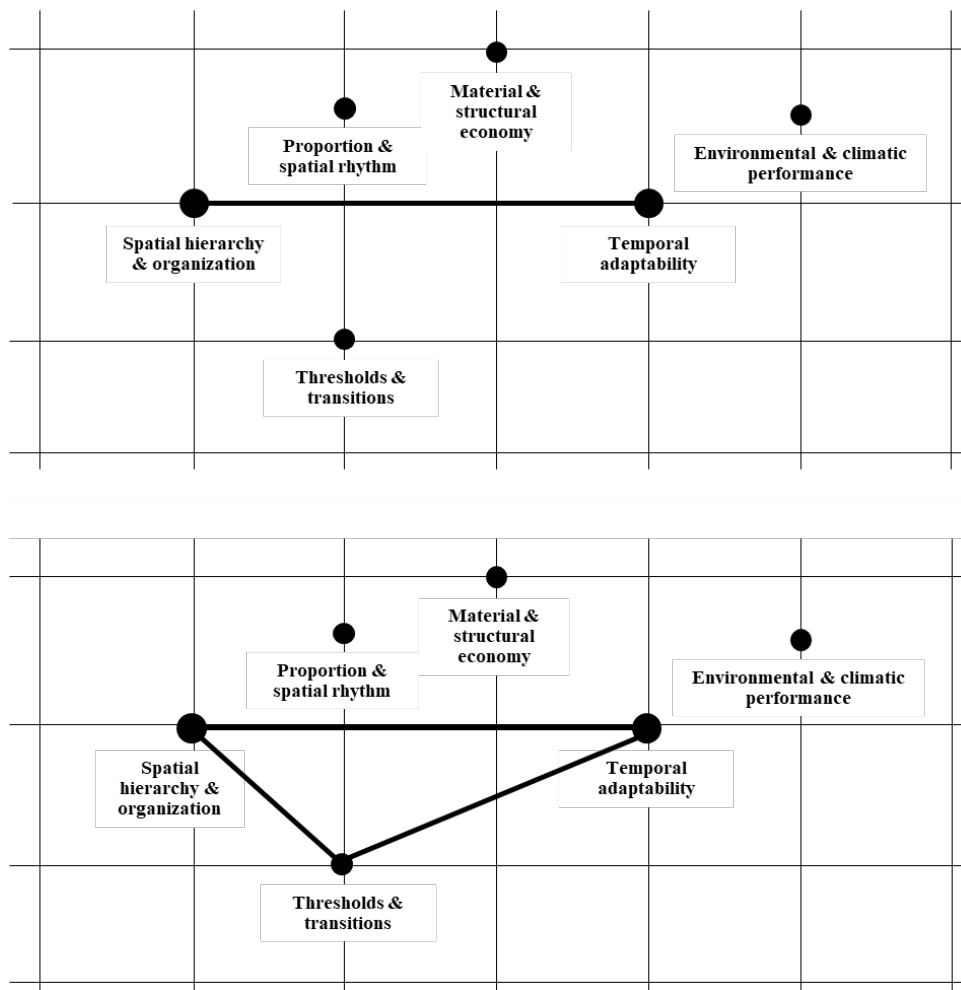


Fig. 2. The six analytical dimensions of spatial intelligence as interdependent constellations. With connecting lines illustrating selected relational interactions between dimensions. Source: Author's own work.

The analytical structure established here guides **Sections 4** and **5**. **Section 4** is organized through a set of analytical layers, each foregrounding a primary lens, while **Section 5** synthesizes the findings into a set of design principles. Across these layers, secondary lenses inform the reading where relevant, allowing embedded qualities to emerge across multiple dimensions.

3.2 Data Sources and Analytical Materials

Multiple sources were used for reinterpretation through the established six analytical dimensions outlined in the previous subsection. These include scholarly literature, archival documents, original architectural drawings, and first-hand field observations.

Archival sources were drawn from published studies by Aalund (1978), Hanna (1981) and Raymond and Wiet (1979) that relied on *waqf* documents, historical surveys, and typological analyses of Cairo's marketplaces. In addition, original architectural drawings from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, were consulted to verify spatial configurations, hierarchies, proportions, and construction details of Wekalet Bazaraa (see **Appendix A, Figs. A1–A7**). The drawings were also used to validate historical descriptions against existing conditions.

Fieldwork was carried out in May 2025 through on-site measurement, documentation, and observation. Room dimensions were recorded using a handheld laser distance measurement tool. Spot temperature readings were taken using a handheld infrared thermometer at comparable heights across selected zones, including the courtyard, arcaded corridors, and interior rooms. Light behaviour was observed in relation to openings and thresholds. These readings were cross-checked with published studies to verify relative differences between zones and support the identification of qualitative recurring spatial patterns.

Visual documentation was compiled from multiple sources, including photographs captured during the site visit (2025), photographs by Lamiaa Ghaz, used with permission, archival material from the Saleh Lamei Collection (1987), and analytical illustrations produced by the author. Together, these visual records supported the spatial, material, and environmental analysis of Wekalet Bazaraa (see **Appendix B, Figs. B1–B3**).

4. Wekalet Bazaraa: Vernacular Intelligence and Adaptation

4.1. Historical Context and Patronage

Located within Cairo's historic commercial core, Wekalet Bazaraa is one of the most intact surviving examples of vernacular market architecture. The building's historical evolution is read here through its capacity to accommodate continuity and change over time.

Scholars differ on Wekalet Bazaraa's exact date and origin due to its multiple reconstructions and repurposing. Moussa (2026) explains that despite the *waqf* deed of Aisha Khatun dated 1751, which records an Ottoman reconstruction, the plan of Wekalet Bazaraa retains distinct Mamluk spatial characteristics. These include asymmetry, vertical layering with four upper floors, and an exterior staircase that separates the residential from the commercial units. According to Moussa (2026), these elements reveal that the Ottoman rebuilding largely followed the original Mamluk layout. This continuity across periods indicates that patronage operated through spatial adaptation instead of through formal replacement.

Aalund (1978) attributes the structure to the late seventeenth century, following several phases of rebuilding that nonetheless respected the established typology. He notes that the *wekala* initially served merchants from Damascus trading woven textiles and was later reconstructed as a leather bazaar, with *waqf* revenues directed toward supporting a school. Abdel-Aal et al. (2018) similarly associate the *wekala* with earlier wood trade up until the nineteenth century. These

shifting uses reflect a historically embedded capacity to absorb changing commercial demands within a consistent spatial framework.

In 1749 AD, the *wekala* was acquired by Aisha Khatun, who partially rebuilt and established it as part of her *waqf*. Through this institutional system, trade revenues supported mosques, schools, and public facilities, creating self-sustaining urban cycles in which private commercial activities served collective welfare. This linked commercial activity to long-term civic support.

Ethical principles articulated through *fiqh al-imarah* and *fiqh al-muamalat*, which emphasize fairness and reciprocity in human dealings, operated not as abstract values but as spatial and economic constraints. Fairness and reciprocity regulated scale, access, and use, limiting excess while sustaining long-term viability.

In early Islamic urban thought, design was guided by purpose and necessity rather than display (Azab, 2013). Scholars such as al-Mawardi and Ibn Abi al-Rabi emphasized that markets should be proportional to the needs of their communities; large enough to serve but not excessive to the point of waste nor harm. Ibn Abi al-Rabi explained that an oversized market risked stagnation, while undersized ones produced scarcity. Proportionality thus aligned spatial capacity with long-term use.

Wekalet Bazaraa still preserved the integrated nature of earlier market typologies: a structure that combined storage, exchange, and residence around a central courtyard. Aalund (1978) noted that it was situated within a cluster of *waqf*-supported projects that together formed a miniature civic ecosystem where commerce, worship, and education coexisted within walking distance. The building reflects a Mamluk-rooted form that adapted to Ottoman reconstruction, sustained through *waqf* ethics, and continually repurposed to meet evolving social and economic needs.

4.2. Spatial and Architectural Intelligence

This section foregrounds the lenses of **spatial hierarchy and organization, proportion and spatial rhythm, and thresholds and transitions** to analyse how movement, privacy, social interaction, and environmental moderation are structured through the *wekala*'s layout and sectional logic.

Spatial Hierarchy and Organization

Wekalet Bazaraa served both residents and street users, including merchants and passers-by. The *wekala* is five stories high. The ground and first floors accommodated commercial activity through shops, temporary trade spaces and wholesale dealings while the upper levels provided rooms for lodging and longer stays.

Hierarchy is expressed both spatially and dimensionally (**Fig. 3**). Larger, more public spaces such as the courtyard and ground-floor trade zones expand horizontally to accommodate collective activity and circulation, while domestic units are organized vertically in more compact, proportionally controlled volumes that support privacy and long-term inhabitation.

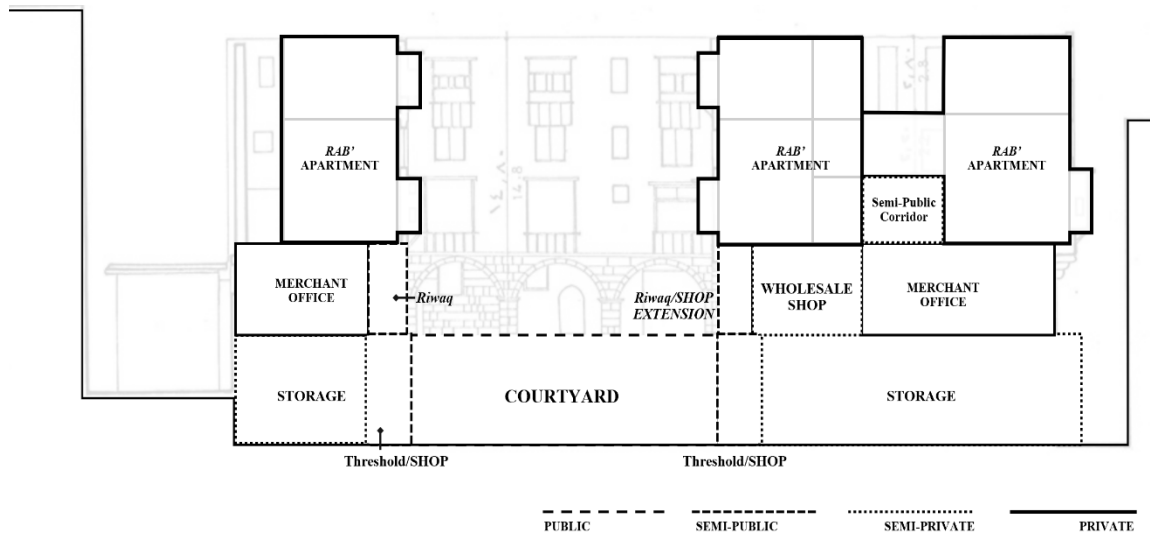


Fig. 3. Analytical section diagram of Wekalet Bazaraa illustrating spatial hierarchy and public–private gradients. Source: Base archival drawing from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and annotations by the author.

Aalund (1978) describes the *wekala*'s dwellings as *maisonettes* or *rab'* with floor areas that vary between 70–140 square meters, expanding vertically over the second, third, and fourth floors (**Fig. 4**). Each unit is organized vertically around a stair-linked sequence of spaces, including a double-height living area and upper rooms that accommodate flexible use.

The courtyard acts as the spatial datum, anchoring visual, structural, and environmental order (**Fig. 5**). Order is concentrated around the courtyard, while adaptability occurs along the building's perimeter through shared walls and irregular forms that merge with the surrounding fabric (**Fig. 6**). Everything in between was mediated, with greater rigidity in proximity to the courtyard and increasing fluidity toward the perimeter.

The main entrance is grand for emphasis as the public entrance and to accommodate travelling merchants arriving in caravans. Along the street façade, a number of ground-floor shops open

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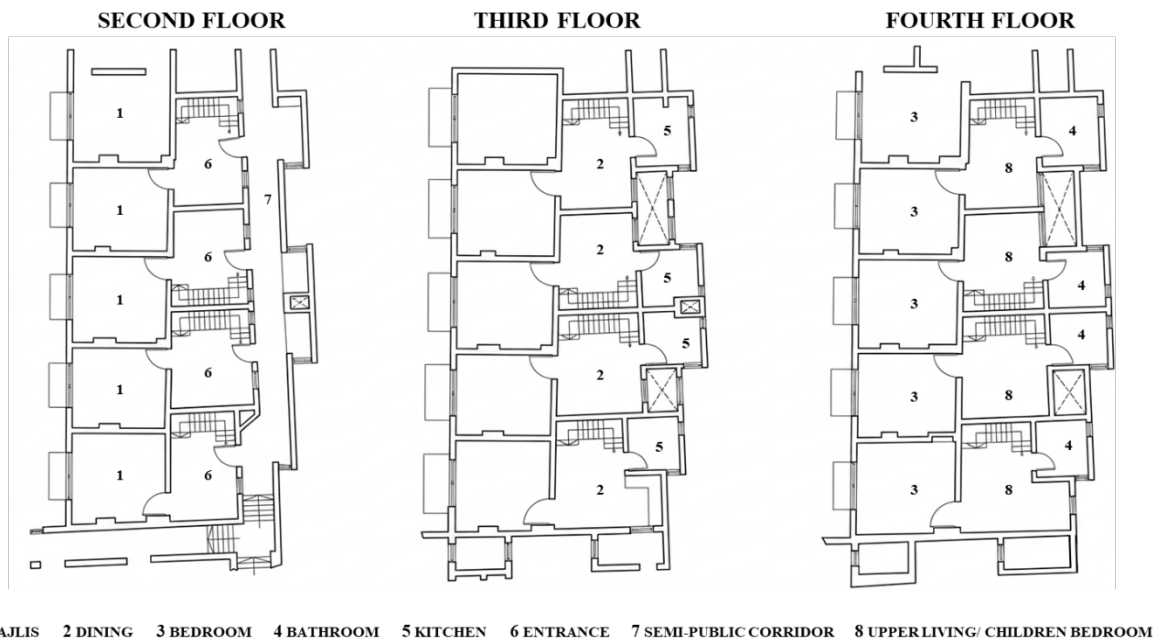


Fig. 4. Plan of the rab' apartments in Wekalet Bazaraa. Source: Redrawn and adapted by the author based on drawings by Flemming Aalund, as reproduced in Shehata, *Framework for the Comprehensive Assessment of the Adaptive Reuse of Heritage Buildings*, p. 101.

directly onto al-Tumbakshiyya Street, serving both residents and passers-by. These shops operate independently from the courtyard, forming the most public commercial layer of the *wekala*. Inside, trade continues in more controlled forms in the courtyard and on the first floor, accommodating temporary bazaars and wholesale activity.

A secondary entrance along the same façade follows the Islamic principle of *la darar wa la dirar*, providing residents with a private access route separate from commercial activity (**Fig. 7**).

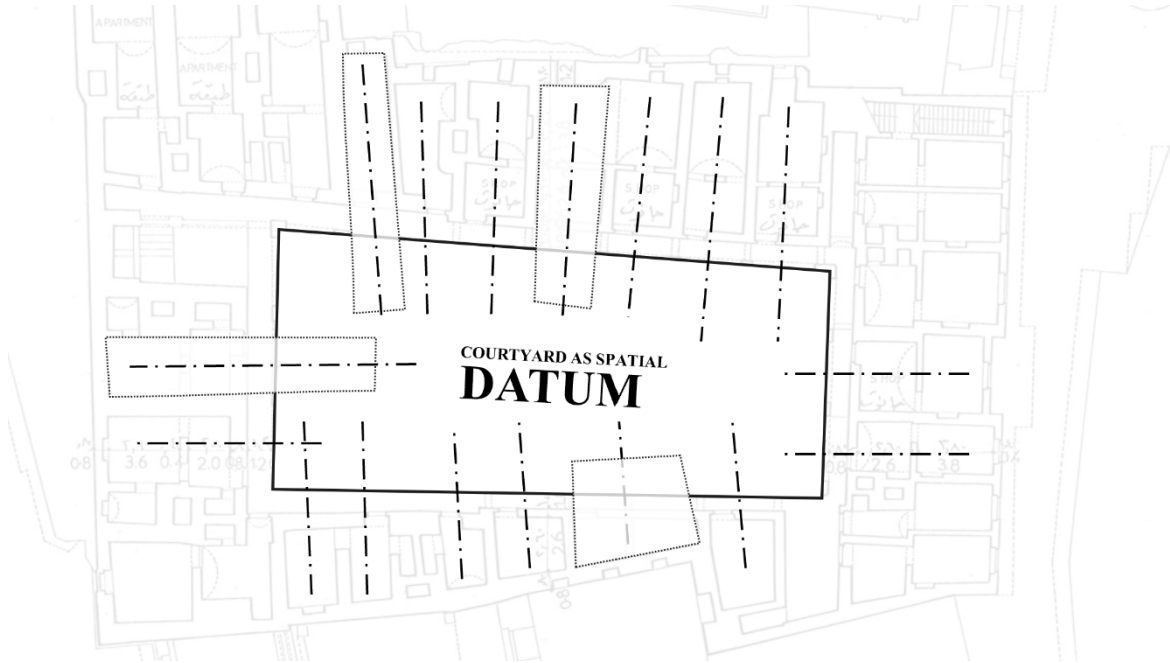


Fig. 5. Courtyard as spatial datum in Wekalet Bazaraa. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

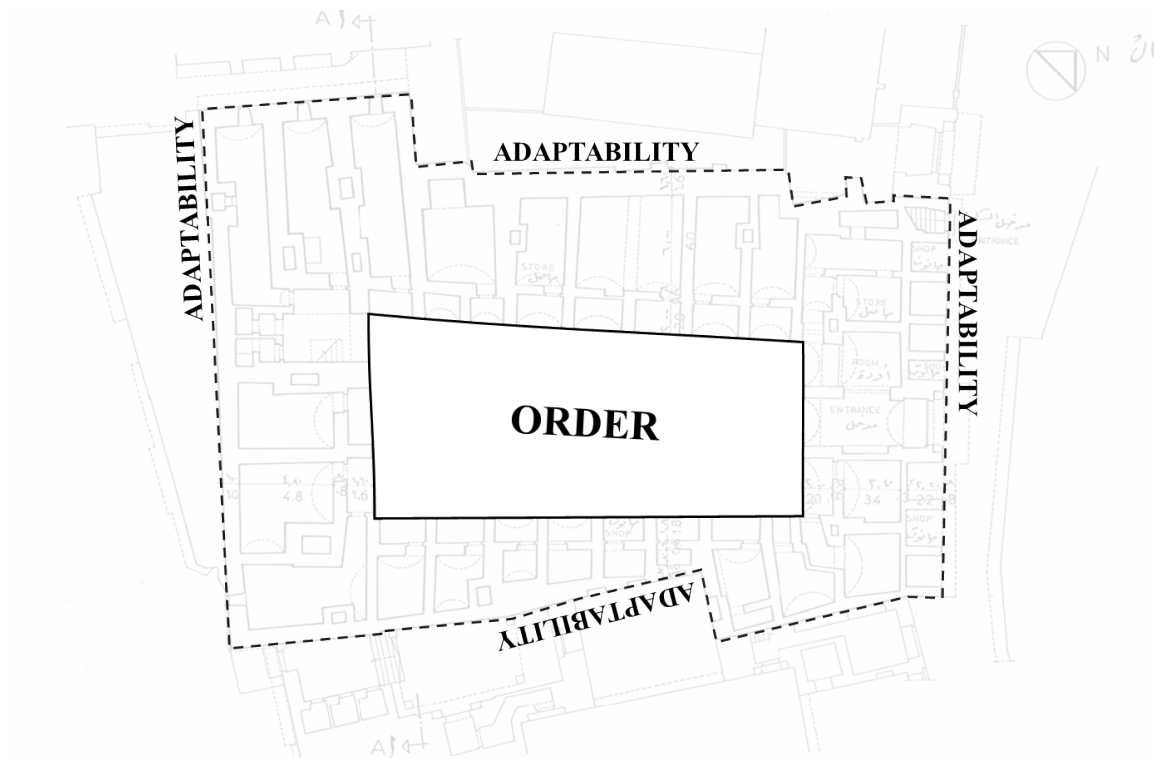


Fig. 6. Order and adaptability in Wekalet Bazaraa. Diagram illustrating geometric control around the courtyard and adaptive integration along the perimeter. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

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Fig. 7. Façade of Wekalet Bazaraa, highlighting the main entrance (centre) and the separate rab' entrance on the right. Source: Author's own work.

Corridors on the second floor provide access to the three-storey apartments and are strategically placed to maintain orientation and privacy. This organization places the corridor along the perimeter, adjacent to neighbouring buildings, establishing it as a more public layer that buffers the private dwellings from direct exposure.

While the organization protects dwellings from direct adjacency to neighbouring buildings, it also distributes spatial priority according to environmental and contextual conditions. Where the alternative is proximity to surrounding fabric, apartments turn toward the courtyard to secure controlled light, ventilation, and outlook (**Fig. 8**). Along the north-east façade, however, the situation differs: here the building fronts the street rather than another structure. In this case,

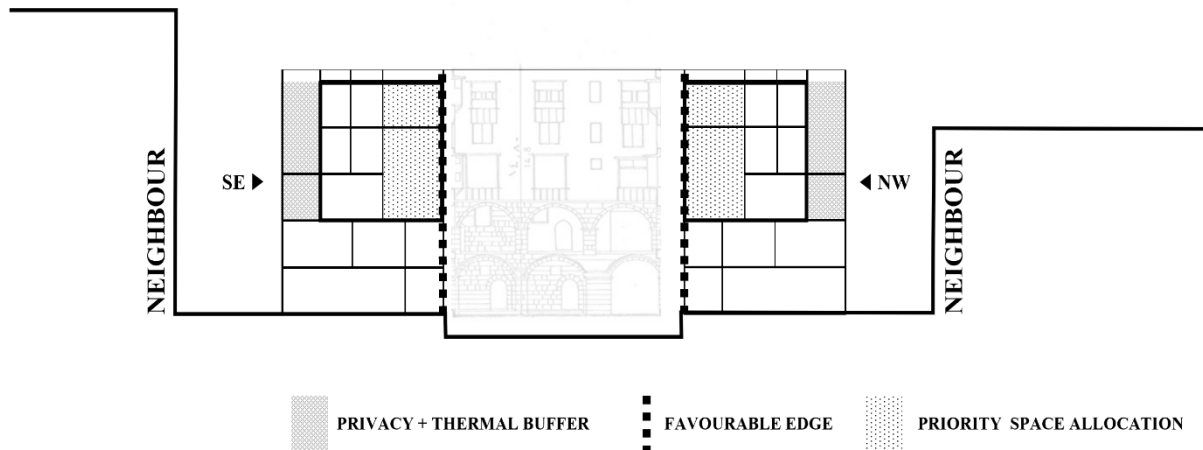


Fig. 8. Priority space allocation relative to courtyard-oriented edge conditions in Wekalet Bazaraa. Primary spaces occupy the inward-facing edge, while circulation and service layers buffer adjacency to neighbouring fabric. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

the dwellings and ground floor shops are prioritised toward the street, benefiting from its favourable edge (**Fig. 9**), while the corridor occupies the less advantageous southern inner edge.

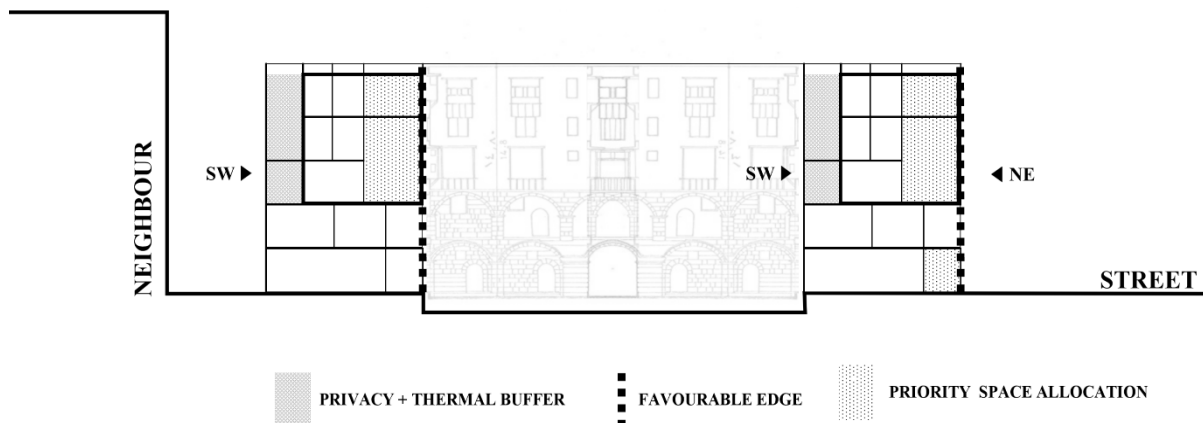


Fig. 9. Reversal of priority allocation along the street façade in Wekalet Bazaraa. Primary spaces engage the street frontage, while circulation occupies the less favourable inner edge. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

Proportion and Spatial Rhythm

The central courtyard creates grounding order that contrasts the building's outer edges which merge with the irregular fabric. Roughly 25×11 meters, the courtyard's 2:1 ratio produces a comfortable scale for visibility, ventilation and interaction.

Within this order, the internal spaces generally follow simple proportional logics such as 1:1 and 1:2, both horizontally and vertically (**Fig. 10**). These ratios operate as guides rather than fixed rules, adapting to context, orientation, and structure.

These proportions allow spans derived from local materials, resulting in structural efficiency without waste while aligning with the principle of moderation (*wasatiyyah*).

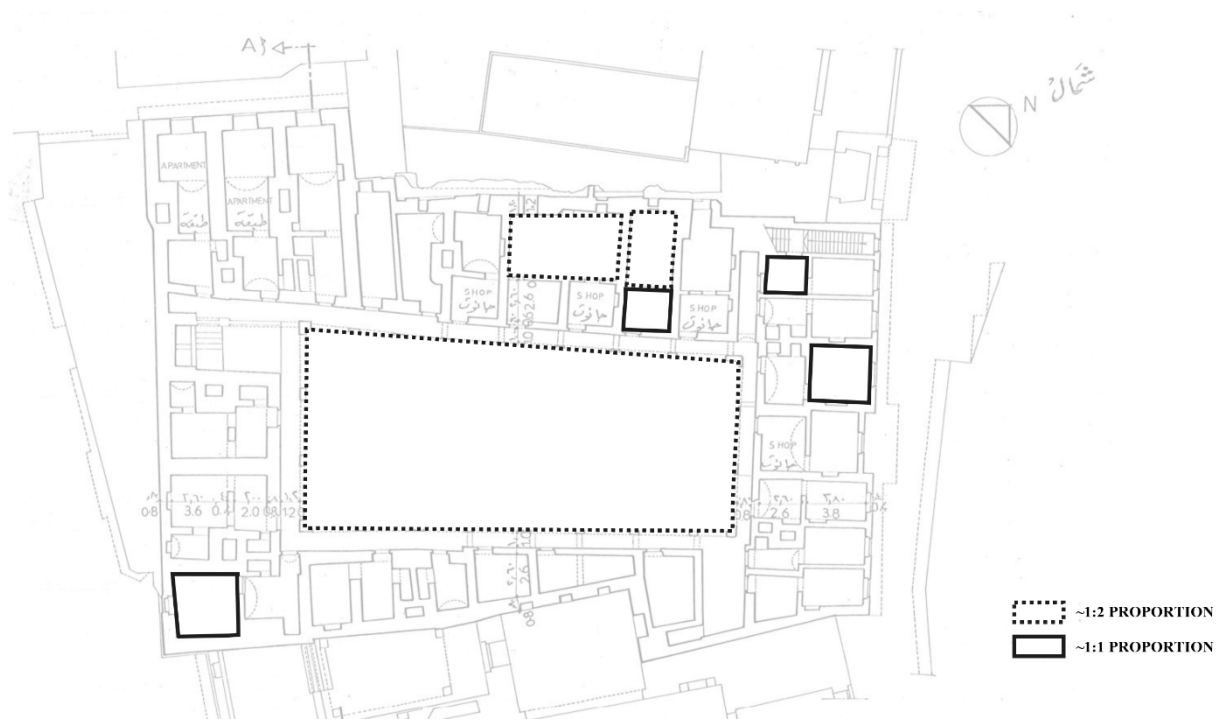


Fig. 10. Sample proportional relationships across selected first-floor spaces of Wekalet Bazaraa. Dashed $\approx 1:2$; solid $\approx 1:1$. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

Thresholds and Transitions

Wekalet Bazaraa regulates movement through layered thresholds that distinguish between direct commercial exchange and controlled internal access.

At the street level, ground-floor shops open directly onto al-Tumbakshiiyya Street, operating independently from the rest of the building. Above them, the corbelled upper floors project outward, creating a shaded and compressed strip along the façade (**Fig. 11**). This overhang

forms a subtle threshold between open street and enclosed shop, moderating scale and exposure before entry. On upper floors, this corbelling also extends primary spaces onto the main street, mediating two realms: the private and public.

The main entrance follows a different sequence. Movement does not lead directly to the courtyard but passes through transitional spaces marked by variations in ceiling height and openings. These shifts compress and filter movement, withdrawing visitors from the street before releasing them into the central courtyard.

The courtyard functions as both gathering space and intermediary threshold, anchoring circulation and trade while remaining enclosed and inwardly oriented. Surrounding arcaded thresholds form a further ring of transition between the open court and enclosed storage spaces (**Fig. 12**). These arcades regulate access and, at times, transform into shops (*hanoot*), allowing exchange to extend into the transitional zone itself.



Fig. 11. Corbelled upper stories of Wekalet Bazaraa illustrating the façade overhang as a shaded transitional threshold between street and shop. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

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Fig. 12. Courtyard of Wekalet Bazaraa showing arcaded thresholds on the ground floor and shaded corridors on the first floor. Source: Photograph by Lamiaa Ghaz, used with permission.

On the first floor, the arcaded corridor (*riwaq*) allows commercial display to extend into the circulation space (**Fig. 13**).



Fig. 13. First-floor *riwaq* illustrating commercial spillover into the arcaded circulation space. Source: Field photograph by the author; analytical reconstruction and diagramming by the author.

Access to upper residential levels is mediated through controlled vertical entry, reinforcing separation between commercial and domestic domains. **Fig. 14** illustrates parallel transition sequences across the ground floor, tracing selected thresholds from the public street to increasingly controlled interior spaces and mapping the gradient from public to semi-private.

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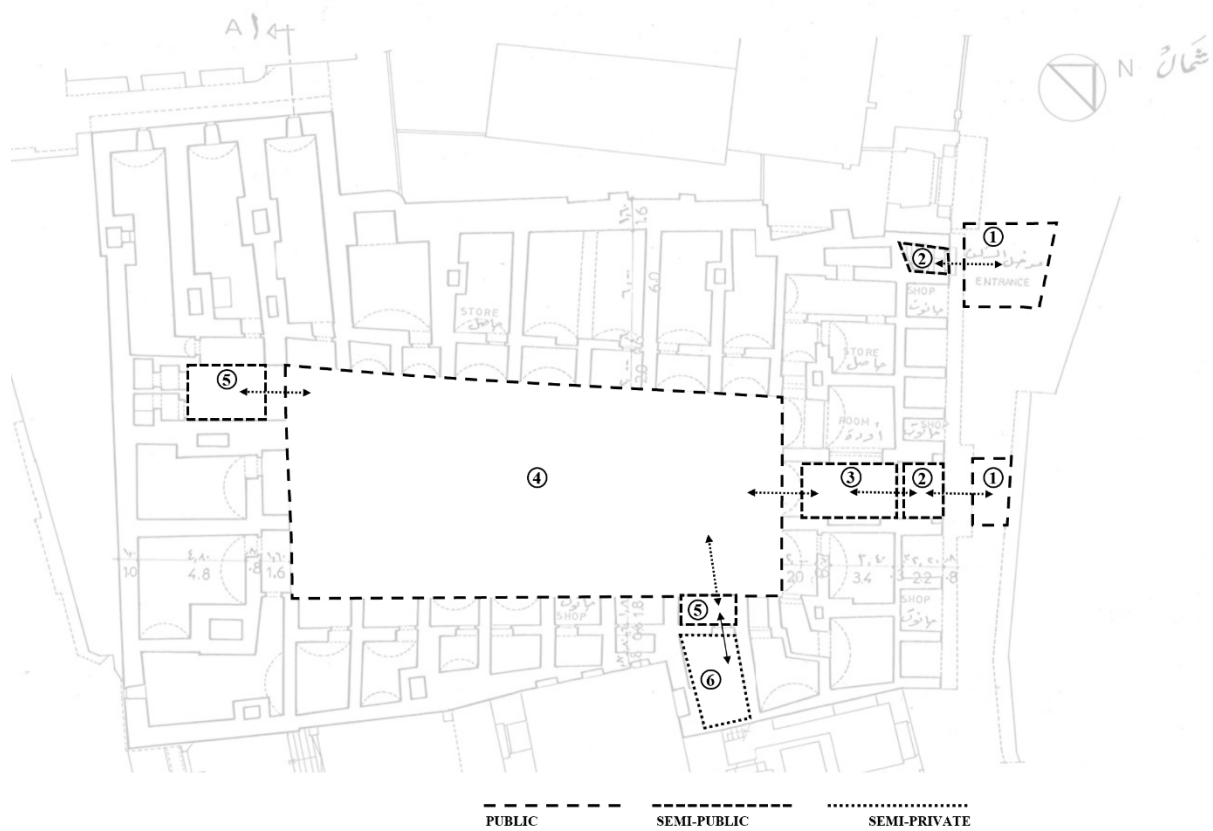


Fig. 14. Parallel transition sequences and privacy gradient across the ground floor of Wekalet Bazaraa. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

4.3. Structural and Material Intelligence

This section applies the **material and structural economy lens** to examine how construction systems, material hierarchy, and assembly logic organize durability, efficiency, and long-term use. Structural and material intelligence is understood here as the calibrated distribution of materials, the alignment of structural form with use, and the capacity for modular repair and renewal over time.

Material Hierarchy

In Wekalet Bazaraa, the lower levels were built of thick limestone and rubble masonry, the most available materials in the area. These provided strength, stability, and longevity appropriate for load-bearing commercial use, while also offering thermal mass beneficial for storage and trade. The upper levels, by contrast, were made of lighter fired-brick walls supported by timber beams to reduce load and allow air to circulate. This gradual transition from heavy to light followed a practical logic of efficiency, ensuring strength and comfort without waste. Material layering also corresponds to the social layering; stone is used on the lower levels in the commercial and more public spaces, while brick is used for the upper floor residential spaces. As illustrated in **Fig. 15**, the diagrammed section makes visible both the material hierarchy and the structural bearing system, clarifying how load, use, and construction logic align across levels. The intelligence reflects a calibrated distribution of resources across the building.

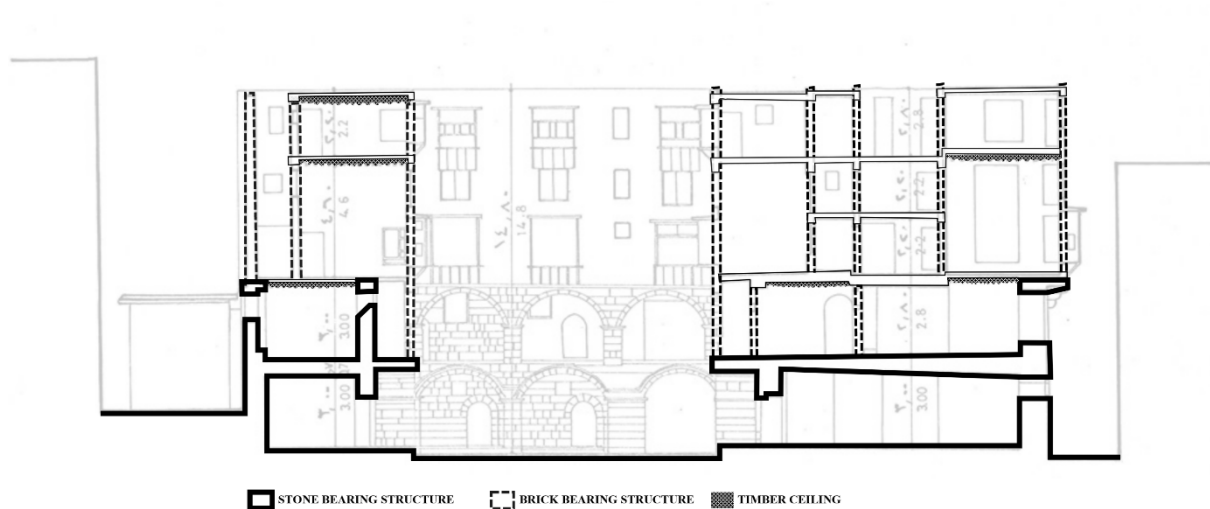


Fig. 15. Section diagram of Wekalet Bazaraa illustrating material hierarchy and bearing structure. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

Structural Form and Use

The ground floor is made up of barrel-vaulted storage bays whose form distributes load efficiently while maintaining spans clear of columns for more efficient storing. Some of the merchant office rooms on the first floor are also barrel-vaulted. This vaulting also differentiates the commercial parts of the building from the domestic levels that are flat roofed.

Modularity and Repair

Timber and brick components were arranged in modular spans that could be easily repaired or replaced when needed. This made the building adaptable and long-lasting. Instead of seeing permanence as something fixed, it was achieved through the possibility of renewal. Builders worked with local materials and relied on precise construction techniques familiar to the region, embedding maintenance within the structure logic itself.

4.4. Environmental and Climatic Intelligence

This section applies the **environmental and climatic performance** lens to interpret how orientation, massing, courtyards, shading devices, and material thickness generate comfort through passive means rather than mechanical control. The analysis is structured through three coordinated mechanisms: orientation and urban adjacency, ventilation and spatial layering, and material mass and surface regulation, which together regulate light, heat, and airflow across the building.

Orientation and Urban Adjacency

The *wekala*'s main façade and entrance face north-east, an adaptive response to the dense urban context that surrounds it on the remaining sides. This orientation reduces direct heat exposure along the main façade. Neighbouring buildings act as thermal buffers to the boundary walls that would otherwise be most exposed to the sun. These adjacent buildings are either directly attached or closely paralleled with narrow streets in between, creating mutual shading.

Although the upper stories are corbelled, their primary role appears to be the spatial expansion of upper floors toward the favourable north-eastern orientation; any resulting self-shading effect is secondary rather than the sole climatic intention (Aalund, 1978).

Ventilation and Spatial Layering

Torky (2025) notes that the *wekala*'s main entrance was recessed from the street, acting as a shaded transition zone that filtered dust and hot air before reaching the courtyard. The vaulted passageway leading inside guided airflow and created a micro-cooling effect through compression and release.

The central courtyard is the core of the *wekala*'s environmental and climatic system, it acts as a natural regulator of air, light, and temperature. The courtyard's height-to-width ratio supports stack ventilation (Eldardiry, 2016; Abdel-Aal et al., 2018). At the centre of the courtyard was historically a fountain (Torky, 2025), contributing to evaporative cooling.

At ground level, arcaded thresholds act as shaded buffers between the courtyard and surrounding storage rooms, reducing heat gain and moderating thermal fluctuation (**Fig. 16**). A comparable logic operates on the upper floor, where a semi-open arcaded corridor tempers airflow and light before reaching adjacent rooms while providing shaded circulation (**Fig. 17**). On the

second floor, circulation continues to operate as a thermal buffer, with edges less filtered by surrounding fabric receiving greater solar exposure (**Fig. 18**).

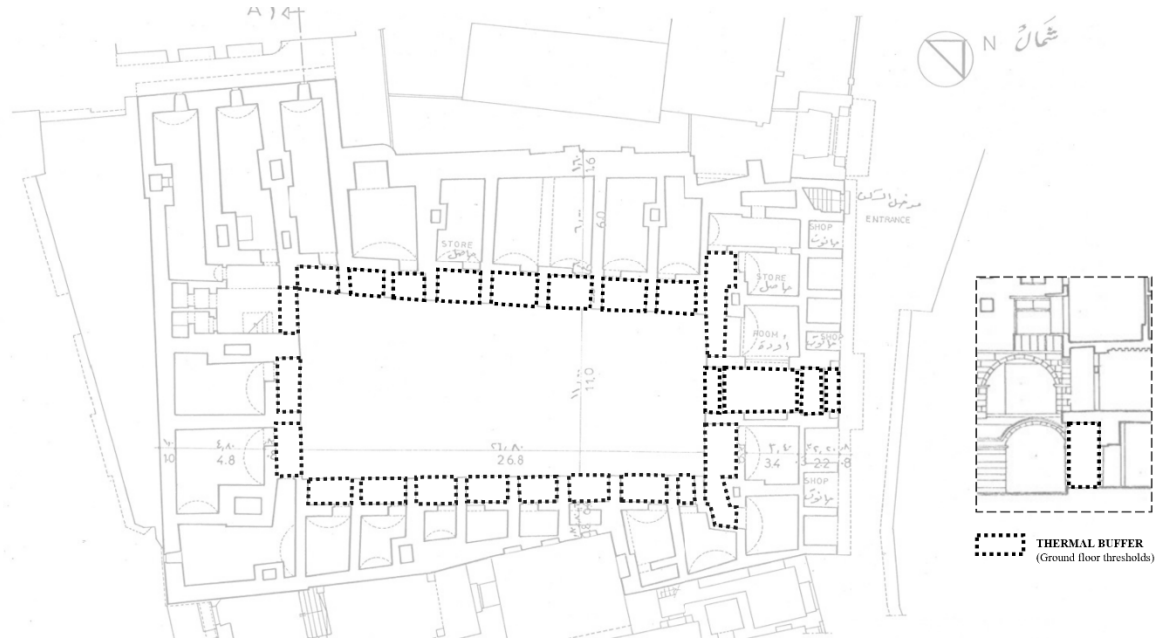


Fig. 16. Ground-floor arcaded thresholds (doubling as *hanoot*) illustrating shaded thermal buffers between the courtyard and enclosed storage spaces. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

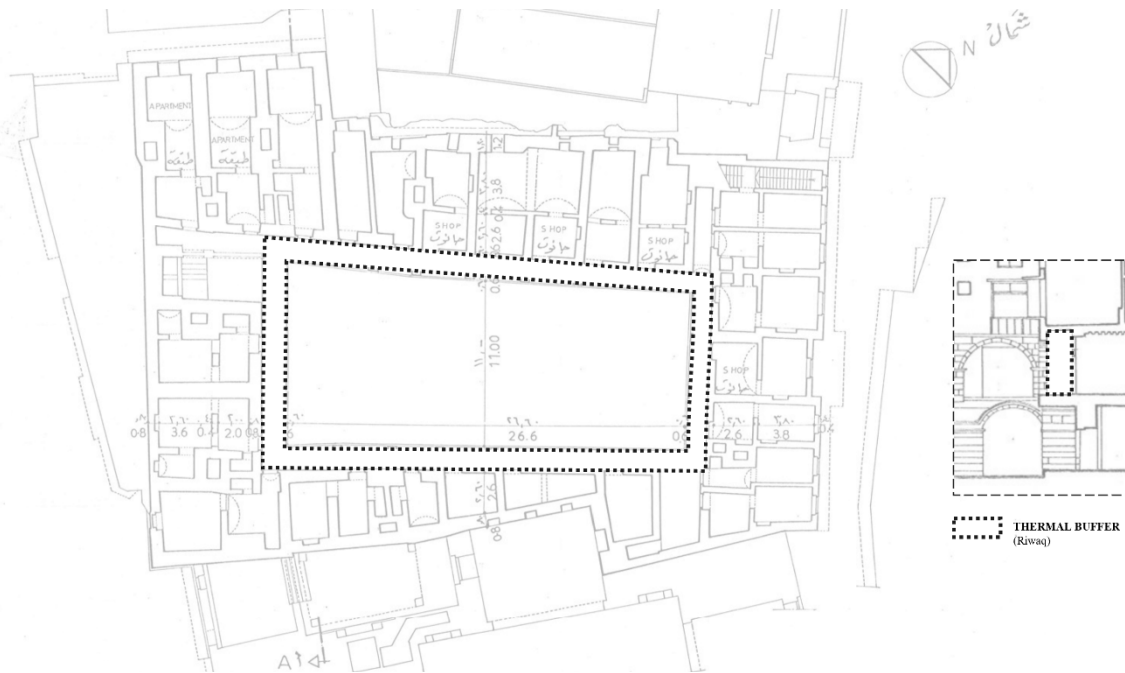


Fig. 17. First-floor *riwaq* illustrating the semi-open arcaded corridor as a thermal buffer moderating exchange between courtyard and interior rooms. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

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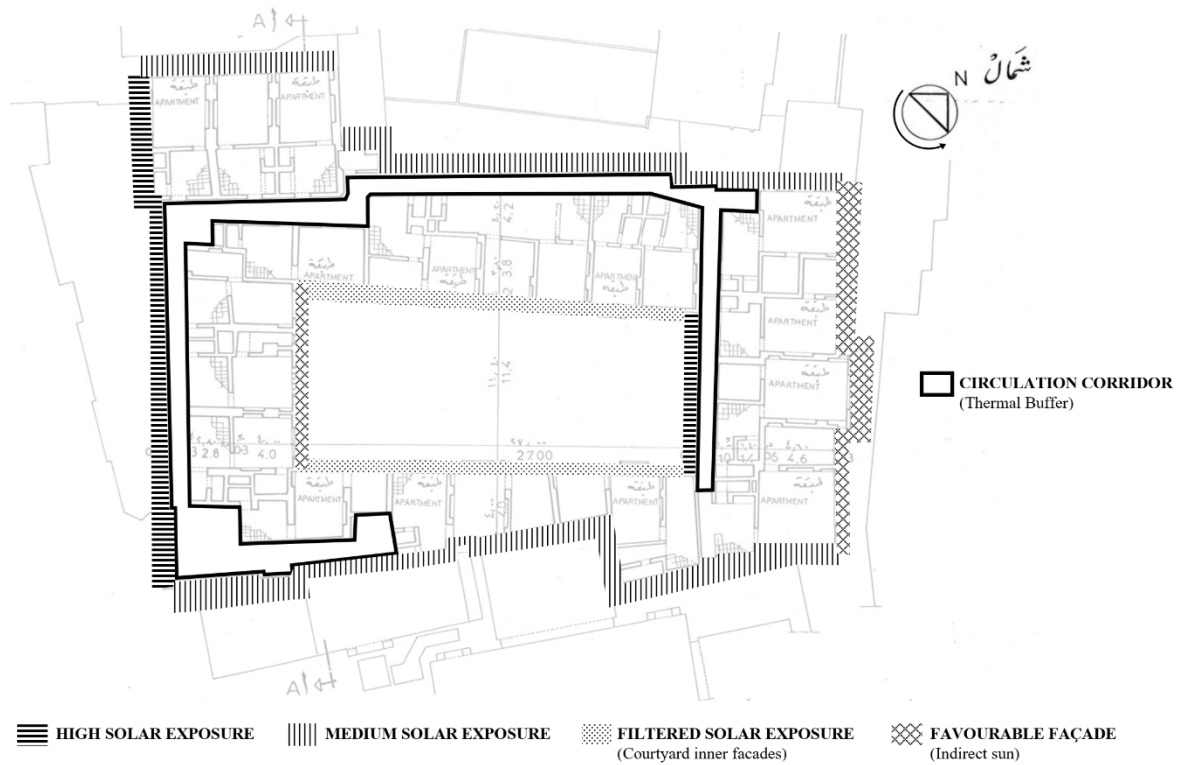


Fig. 18. Second-floor solar exposure diagram illustrating gradients of high, medium, and filtered solar exposure, highlighting favourable façade conditions and the circulation corridor as a thermal buffer. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

Light wells and vertical shafts enhance natural light and airflow, particularly along circulation zones, while corridors placed along exposed edges buffer living spaces from direct solar exposure (Figs. 19–20).

Aalund (1978) also observed double-height living spaces, where hot air rises and exits while cooler air remains at the occupied level.

Material Mass and Surface Regulation

Material thickness further stabilizes internal conditions. Thick stone walls absorb heat during the day and release it slowly at night, maintaining thermal stability (Eldardiry, 2016). Deep-set arches and small openings reduce direct solar penetration in a climate that requires cooling for most of the year. The layering of stone below and brick above improves air movement and reduces heat gain compared to single-material construction (Abdel-Aal et al., 2018).



Fig. 19. Light wells and their effects along the upper residential corridor. Left: view looking up through the vertical shaft admitting daylight. Right: corridor illuminated by the light wells, with a solid eastern wall ensuring privacy and insulation from the neighbouring building without sacrificing natural light. Source: Author's own photos.



Fig. 20. Plan diagram of second-floor light wells and vertical shafts, indicating their contribution to daylighting and passive ventilation of the circulation spine. Source: Base archival material from the Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission; analytical reconstruction and diagramming by the author.

Mashrabiyyas on the upper floors filter sunlight and allow cross-ventilation without sacrificing privacy. They operate as adaptive devices that close during the day and open at night to release stored heat (Aalund, 1978; Eldardiry, 2016).

The flagstone-paved courtyard, described by Sami (n.d.) as a surface used for unloading animals and goods, combines durability with permeability. The stone joints allow drainage while supporting heavy trade activity, integrating environmental performance with logistical function.

4.5. Adaptability, Continuity and Relevance

This section examines how Wekalet Bazaraa accommodates functional change, seasonal use, and evolving commercial practices. **Temporality** here is read as a built-in architectural capacity. The analysis identifies two complementary temporal mechanisms: **Anticipated temporal change**, where spaces alternate dominant functions across daily or seasonal cycles, and **temporal layering**, where long-term spatial roles coexist with short-term or episodic uses within the same architectural framework.

Fig. 21 maps key architectural components of Wekalet Bazaraa according to these two temporal mechanisms.

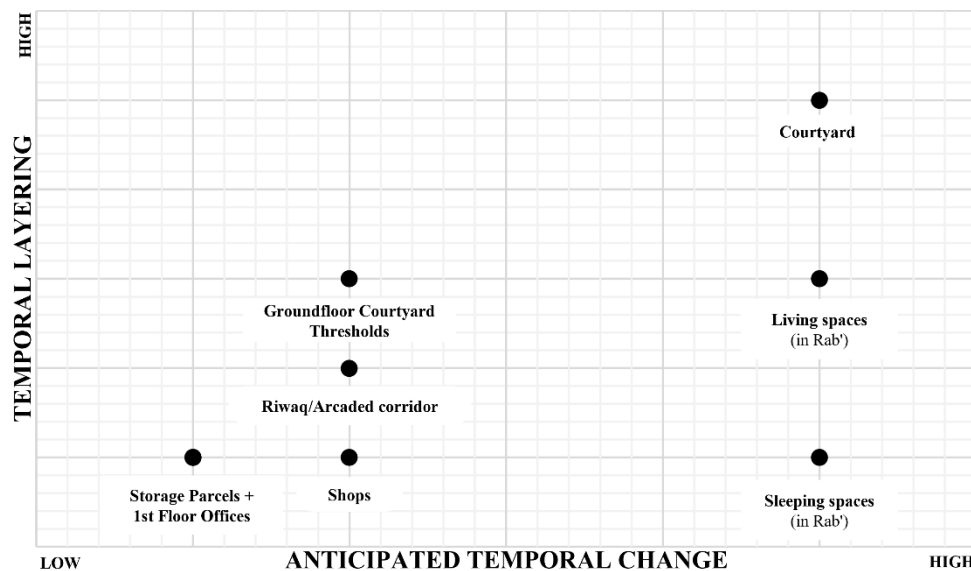


Fig. 21. Analytical diagram mapping key components of Wekalet Bazaraa according to anticipated temporal change (horizontal axis) and temporal layering (vertical axis). Source: Author's analytical diagram based on fieldwork documentation (2025) and secondary sources.

Domestic spaces in Wekalet Bazaraa were not assigned fixed functions. These architectural features enabled residents to shift their patterns of occupation seasonally and throughout the day. More specifically, residents used the open roof terrace for sleeping during the summer, while daytime activities took place downstairs to avoid direct sun and severe heat. In winter, this pattern reversed, with living spaces shifting toward sunlit areas to maximize warmth and comfort.

The courtyard acts as a temporally layered core. It accommodates loading and unloading of goods, storage overflow, temporary bazaars, and social gathering at different moments, while continuously operating as an environmental regulator. Arcaded thresholds around the courtyard and the first-floor *riwaq* allow commercial spillover and circulation to coexist without displacing primary spatial roles.

Functionally, the *wekala* evolved with time and need. Aalund (1978) and scholars that follow, document that it began as a space for wood trade, then accommodated textiles, followed by

commodities like coffee, gum, and soap. This sequence of adaptation demonstrates that the building's design was never bound to one use but could host shifting patterns of commerce while retaining its spatial clarity.

The *wekala* also allowed for the coexistence of permanence and impermanence according to needs of trade. Lifecycle thinking was practiced where durable materials and structures were selected and adaptive reuse was executed.

Wekalet Bazaraa endures and remains seamlessly fitting within Cairo's dense historical core because it was designed to adapt to its context, temporal functions, and users. Its boundaries were shaped by the neighbouring buildings that defined its perimeter. Aalund (1978) proposed to renew the west façade in response to the demolition of its adjacent *wekala*, further emphasizing the building's capacity to respond to contextual changes. Read in this way, temporal adaptability emerges as a precondition of the building's spatial order.

5. Rooted Futures: Reinterpreting Vernacular Intelligence in Contemporary Retail

The framework operates on two levels: as a replicable method for reading spatial intelligence in comparable vernacular market typologies, and as a generator of transferable design principles grounded in a specific case.

The design principles presented in this section are synthesized from the six analytical lenses of spatial intelligence outlined in **Section 3.1**. They were identified through recurring spatial conditions that reappeared across multiple lenses in Sections **4.1** to **4.5**, where the same architectural strategies operated across ethical, organizational, environmental, structural, and temporal logics.

The building's form and function evolved through time while maintaining a sense of balance between trade, dwelling, and social life. Even beyond the building, the civic duty it served to nearby mosques and schools linked commercial activity to civic and institutional support through the *waqf* system. This mixed-use interdependence offers a transferable model for contemporary retail environments, where the separation of programs often weakens community and reduces spatial vitality.

A contemporary parallel is Msheireb Downtown Doha, which reinterprets vernacular principles through shaded streets, courtyards, and mixed-use layering (Aliyar et al., 2023), demonstrating that vernacular spatial logic can inform forward-looking retail environments without literal replication. A systematic application of the six-lens framework to such contemporary cases remains a direction for future research.

Table 1 synthesizes the principles derived from the cross-reading of the six analytical lenses applied in **Section 4**. Organized according to the structure of the analysis, the table translates recurring spatial patterns observed in Wekalet Bazaraa into transferable principles for contemporary retail environments.

Table 1. Design principles for contemporary retail derived from Wekalet Bazaraa. Source: Author's own work (six-lens analytical synthesis).

Primary Analytical Lens	Derived Principle	Core Idea for Contemporary Retail Application
Spatial Hierarchy and Organization	Layered Mixed-Use Integration	Overlap commerce, dwelling, and social life vertically and horizontally to form self-sustaining systems.
	Contextual Coexistence	Negotiate existing urban fabric through shared walls, adaptive edges, and building form mediation around a stable inward-facing core.
	Priority through Edge Allocation	Distribute primary spaces toward favourable orientations while positioning circulation and service layers as environmental and privacy buffers.
Proportion and Spatial Rhythm	Proportion with Purpose	Use simple ratios such as 1:1 and 1:2 to stabilize irregular urban fabrics while preserving contextual adaptation.
	Modulated Harmony	Treat proportion as a guiding logic that balances geometry and context.
Thresholds and Transitions	Layered Threshold Sequences	Structure transitions through arcades, courtyards, and shaded passages to regulate privacy, climate, dust and light.
	Circulation as Buffer	Position corridors along exposed edges to protect primary spaces from heat and sound while mediating privacy gradients.
Material and Structural Economy	Economy of Matter	Distribute heavy and light materials vertically according to load, function, and climate for resource efficiency, durability, and repairability.
	Structure Aligned with Use	Align vaults, spans, and modular systems with programmatic needs for efficiency and clarity.
Environmental and Climatic Performance	Climate as Partner	Orient façades, prioritize favourable edges, layer mass, and integrate courtyards, shafts, and shading devices for passive comfort.
	Shaded Microclimates	Integrate semi-open galleries and arcaded corridors to moderate airflow and solar exposure.
Temporal Adaptability	Temporality as Capacity	Design spaces accommodating seasonal and daily shifts without physical alteration.
	Adaptability as Continuity	Enable long-term functional change through flexible layouts and modular repair.
	Civic Anchoring	Link retail activity to civic and ethical frameworks, calibrating scale and access for collective resilience.

6. Conclusion

This study positions spatial intelligence as an architectural capacity embedded in form. While the term has often been developed in relation to cognitive and experiential dimensions, this research locates it in architectural form as a coordinated system. It responds to the fragmentation of existing approaches to spatial quality, which address aspects in isolation without accounting for their interaction within architectural form. Through a multi-lens analytical framework, it becomes legible as an integrated system that can be read and translated into design principles.

Applied to Wekalet Bazaraa, the framework reveals how hierarchies, proportion, thresholds, material and structural economies, environmental modulation, and temporal use operate together as a coherent system.

This study establishes a method for reading spatial intelligence across architectural contexts. The framework enables the extraction of design principles that can inform contemporary practice, particularly in environments shaped by climatic and urban constraints. In doing so, it re-frames spatial intelligence not only as a cognitive or experiential capacity, but as a readable and transferable property of architectural form.

Beyond the specific findings of this case, this study makes three contributions to the broader discourse on architectural intelligence. Theoretically, it repositions spatial intelligence as a property of architectural form rather than a cognitive capacity of the designer or a perceptual experience of the user, expanding the concept's applicability as an analytical tool. Methodologically, it demonstrates that vernacular buildings can be read as interdependent systems of performance through a structured multi-lens framework, offering a replicable approach for extracting design knowledge from underrepresented building types and regions. Practically, it translates this intelligence into design principles applicable to contemporary retail environments facing climatic and urban pressures, particularly in the Global South. Together, these contributions suggest that spatial intelligence offers a productive framework for rethinking how architecture performs, adapts, and endures.

While this study establishes a framework through a single in-depth case, its broader validity requires application across multiple market typologies and contemporary retail environments. Future research will extend this framework through comparative case studies and design-based testing to evaluate its transferability and performance in applied contexts.

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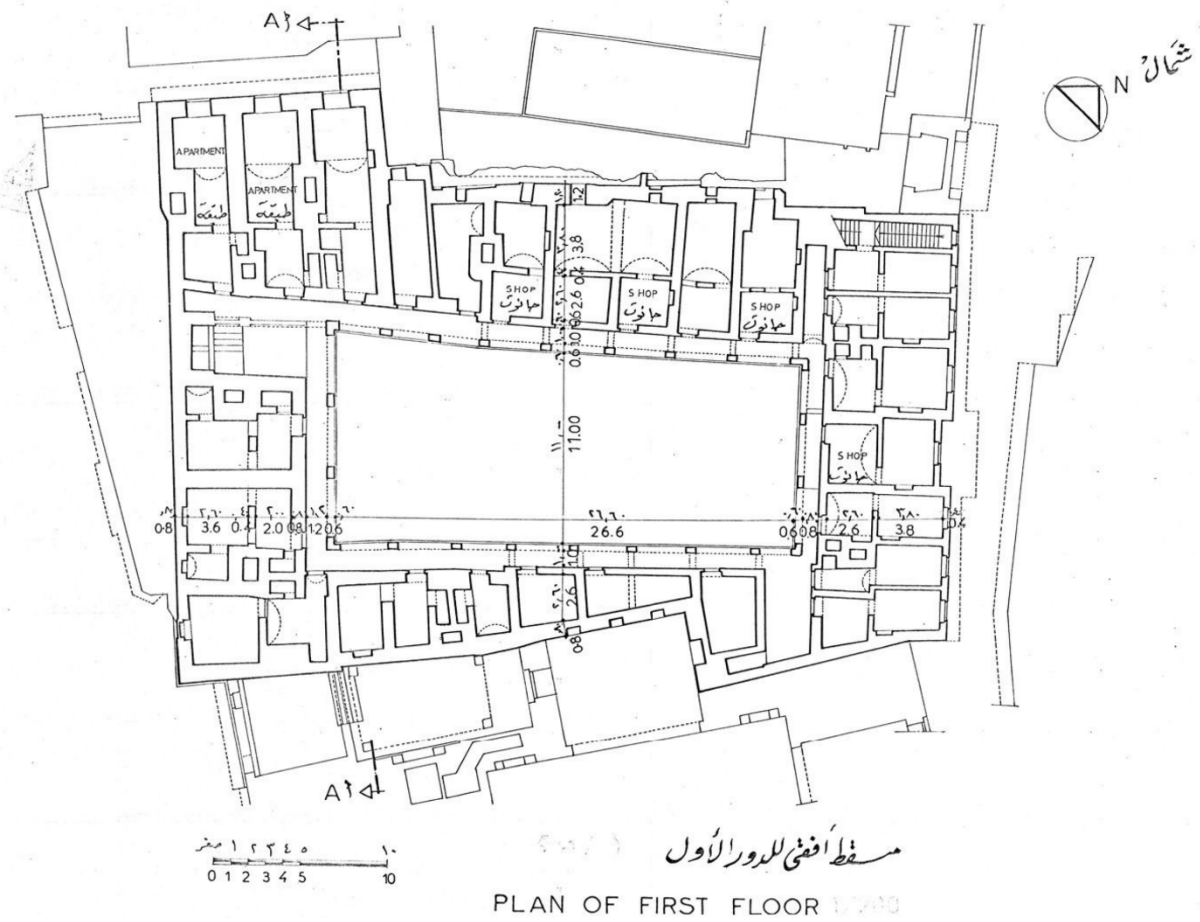


Fig. A2. First floor plan of Wekalet Bazaraa. Source: Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission.

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Fig. A3. Second floor plan of Wekalet Bazaraa. Source: Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission.



Fig. A4. Third floor plan of Wekalet Bazaraa. Source: Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission.

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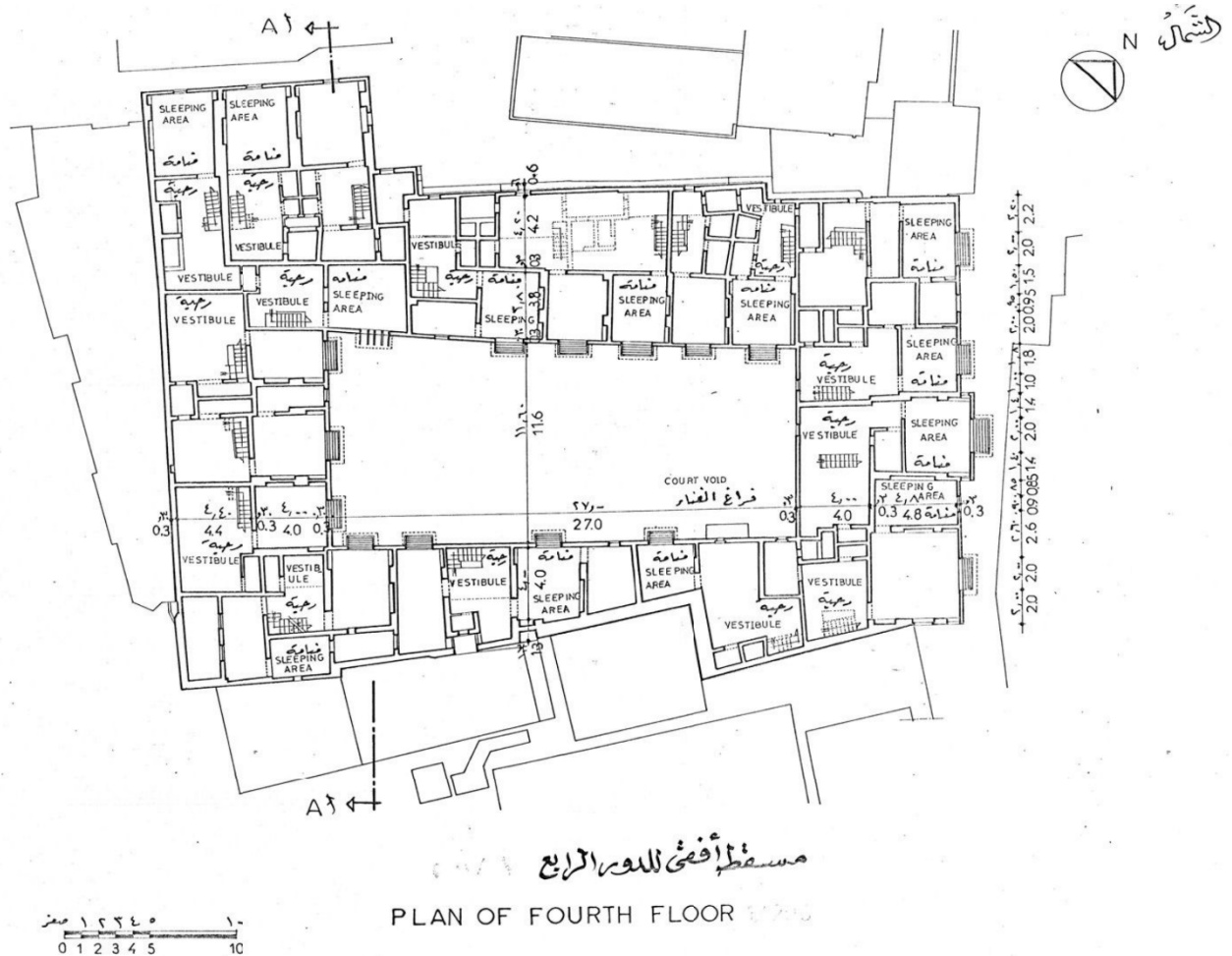


Fig. A5. Fourth floor plan of Wekalet Bazaraa. Source: Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission.

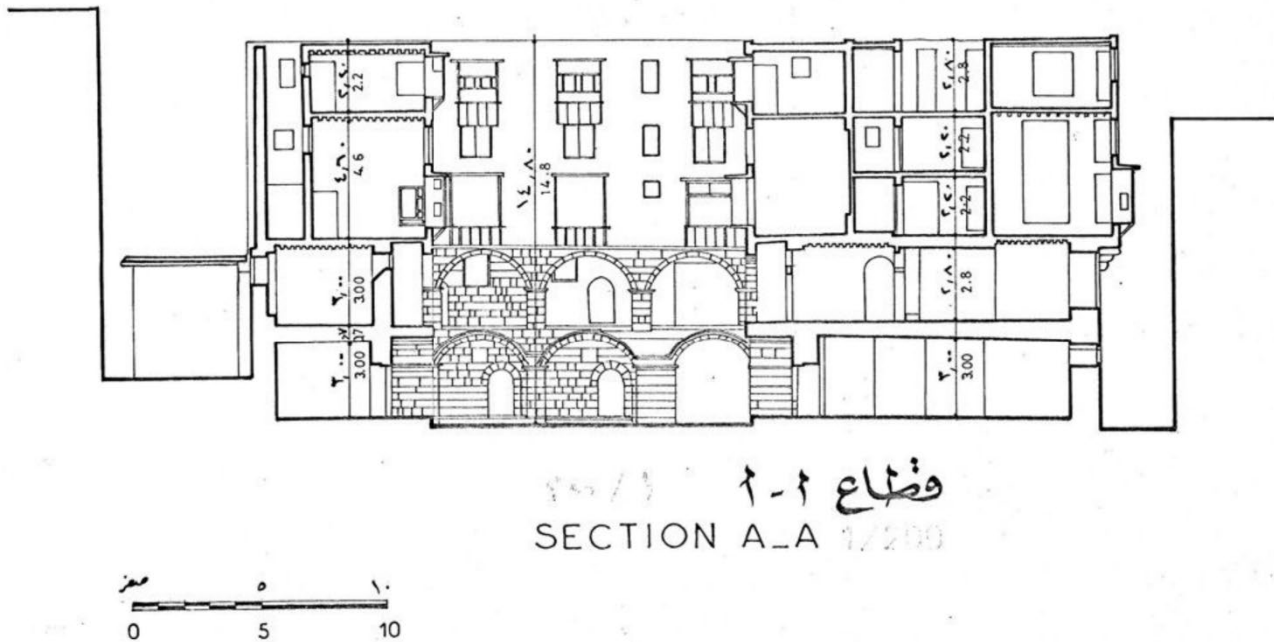


Fig. A6. Cross-section of Wekalet Bazaraa. Source: Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission.

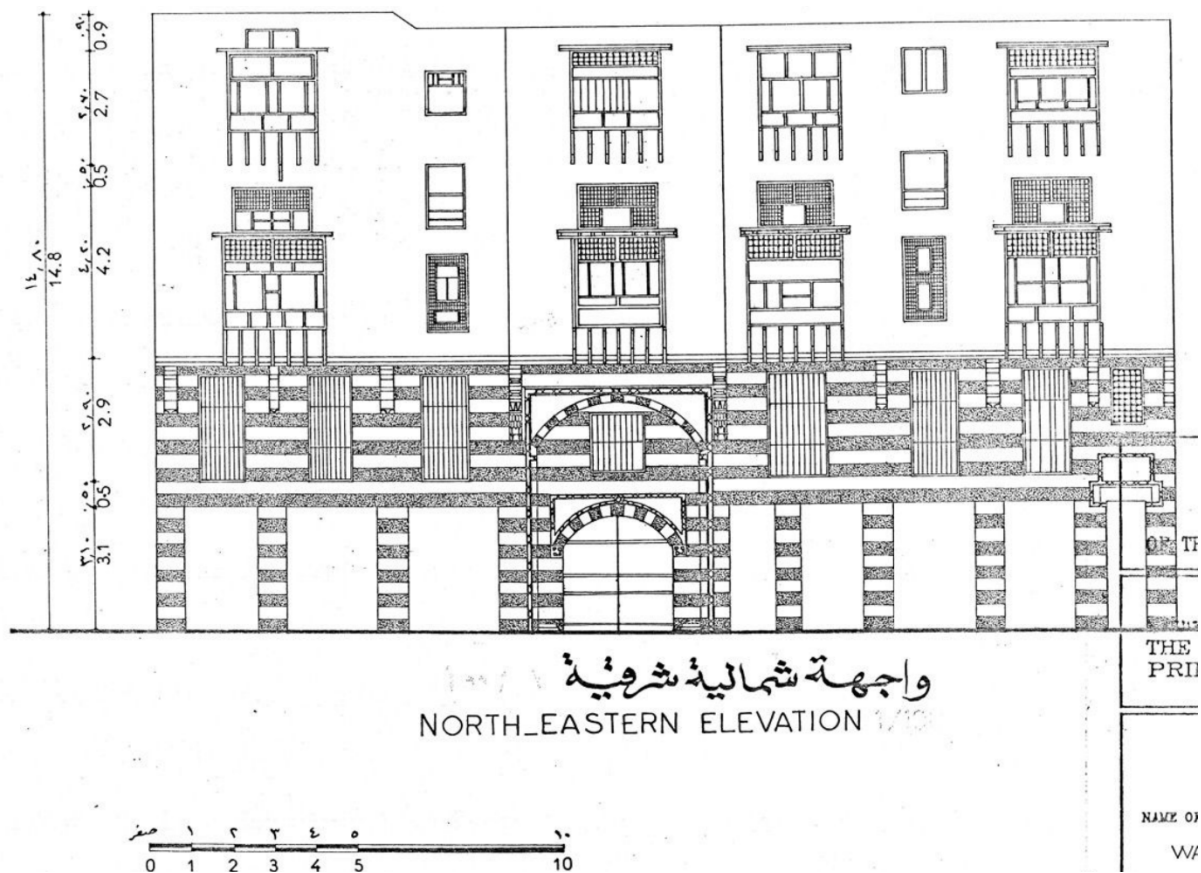


Fig. A7. North-Easter Elevation of Wekalet Bazaraa. Source: Saleh Lamei Collection (1987), courtesy of the Rare Books and Special Collections Library, The American University in Cairo, used with permission.

9. Appendix B. Supplementary Visual Documentation

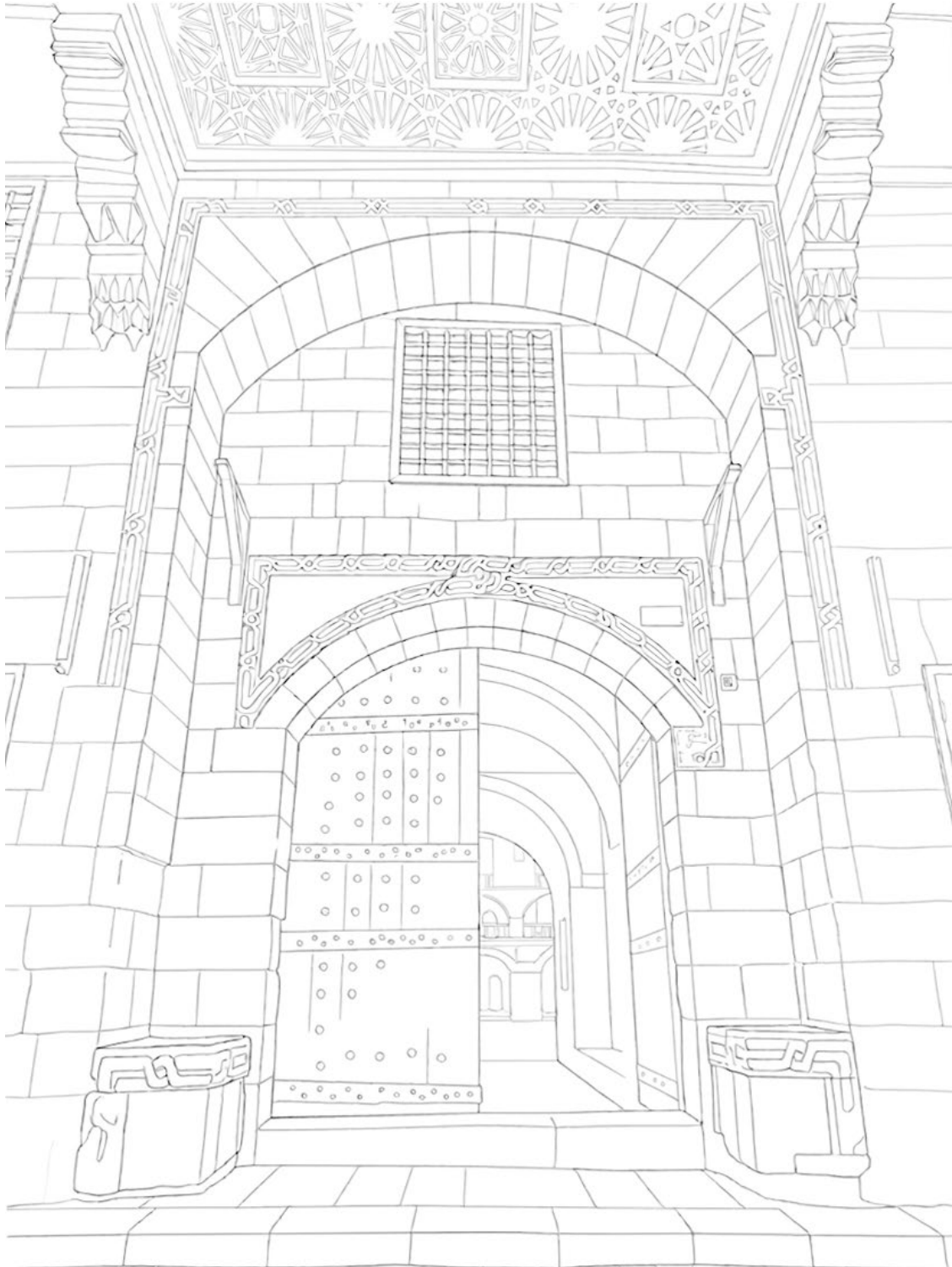


Fig. B1. Entrance portal of Wekalet Bazaraa, showing the recessed façade articulation. Source: Author's own work.



Fig. B2. The vaulted passageway of Wekalet Bazaraa leading to the central courtyard, showing how the narrowing and widening of space guides airflow and creates a micro-cooling effect through compression and release. Photograph by Lamiaa Ghaz, 2019, used with permission.

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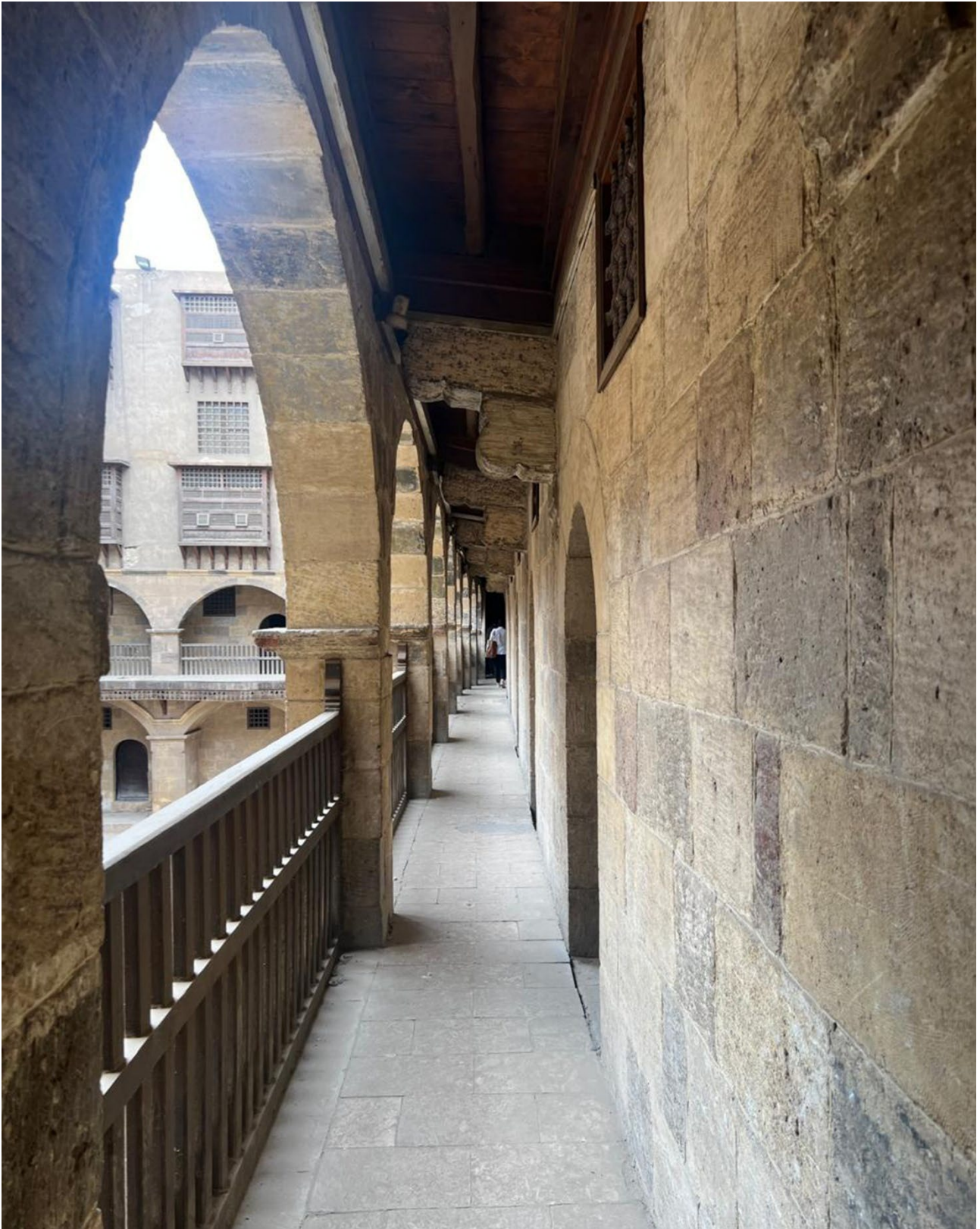


Fig. B3: The *riwaq* (shaded corridor) on the first floor of Wekalet Bazaraa acting as a thermal buffer that minimizes heat transfer to adjacent rooms while providing a well-ventilated circulation path. Photograph by author, 2025.