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# Urban Revitalization of Spatial Memory: Towards the Restoration of Identity in Contemporary Cities

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## ABSTRACT

The urban fabric of contemporary cities is experiencing a decline in spatial memory and collective identity as a result of rapid transformations in urban form and behavior. This research is based on the hypothesis that the continuity and spatial integration of the morphological structure enhance spatial perception and belonging, and that this interconnectedness forms the basis for reviving urban identity. The study adopts an analytical-comparative approach that combines digital spatial analysis using DepthmapX and social analysis through a field survey of residents. This approach compares three historic cities that represent different patterns of spatial memory revival: Fez, which preserved the coherence of its organic fabric and historical continuity; Sarajevo, which rebuilt its collective symbols through the restoration of monuments and public squares; and Aleppo, which demonstrated limited continuity in morphological structure but a strong presence of symbolic and functional memory. The hypothesis was tested by analyzing the relationship between spatial integration indicators and the axes of perception and belonging in the questionnaire, confirming the interconnectedness between urban form and social practice as a mechanism for reviving spatial memory. The study proposes a participatory design framework that integrates digital tools with community data to enhance the continuity of urban memory and identity in contemporary historic cities, emphasizing that reviving spatial memory is a fundamental approach to sustainable urban development and future conservation policies.

**Keywords:** Community participation, Spatial analysis, Spatial memory, Urban identity, Urban revitalization.

## 1. INTRODUCTION

Contemporary cities are witnessing rapid urban and cultural transformations due to globalization and technological development. These transformations have led to a decline in spatial memory and the erosion of collective identity, particularly within historical structures that have for centuries represented the physical and symbolic receptacle of the urban experience, this is what local studies on Baghdad indicate from the perspective of

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morphological growth and street patterns **(Alobaydi and Rashid, 2024; Al-saaidy, 2020)**, field readings show that improving traffic networks and complete streets is associated with increased permeability and spatial awareness at the level of urban sections **(Jassim, 2023).** In this context, spatial memory represents a cognitive-social system that links morphological structure, human behavior, and cultural symbols, and constitutes one of the essential components of the sustainability of urban identity.

**(Lynch, 1960)** presented in his book "The Image of the City" one of the most prominent cognitive frameworks for understanding the relationship between humans and place, explaining that the perception of the city depends on five main elements (landmarks, edges, nodes, paths, and neighborhoods), which contribute to shaping the mental image and collective memory of users. Then **(Rossi,1982)** deepened this understanding, emphasizing that the city represents a "generator of memory" through the accumulation of temporal layers in its architectural fabric, while **(Nora, 1989)** explained that some sites turn into "places of memory" when they are threatened with extinction, becoming symbols that preserve collective history. Recent studies, such as **(Keightley and Pickering, 2023)**, have expanded the concept to emphasize that urban memory is not reduced to its material dimension, but is reshaped through sensory experiences, daily behaviors, and ongoing societal interaction.

Despite the abundance of theoretical literature, Despite the rich theoretical literature, there remains a research gap related to the lack of tools capable of measuring spatial identity and integrating intangible dimensions—such as sensory perception, cultural symbols, and collective behavior—into urban design practices. Most studies have focused on physical preservation without adequately understanding memory as a recurring lived experience.

In this context, **(Ma et al., 2022)** points to the need to develop a complex model to assess spatial identity across four interconnected dimensions: belonging, distinctiveness, continuity, and context, which this study adopts as a comprehensive analytical framework.

From this perspective, the research adopts an analytical-applied approach that combines digital spatial analysis (using DepthmapX) and field social analysis (a cognitive-behavioral questionnaire), to test the hypothesis that the continuity and spatial integration of morphological structures enhance spatial perception and belonging and form the basis for reviving urban identity in historical environments. This hypothesis is tested by comparing three historic cities—Fez, Sarajevo, and Aleppo—that represent different patterns in their approach to memory: continuity, post-conflict revival, and functional reconstruction, with the results applied to the field in the Shawaka neighborhood of Baghdad as a local model bridging theory and practice.

The research aims to build a participatory generative design framework capable of reactivating spatial memory through the integration of form, behavior, and perception, transforming heritage from a physical entity into a renewed living experience that promotes spatial justice and collective identity. To answer the central question: How can spatial memory be restored and urban identity enhanced in historic environments through the integration of digital spatial analysis and community engagement within a generative design framework?

## 2. THEORETICAL FRAMEWORK

This framework forms the conceptual basis from which the study begins to understand the relationship between spatial memory and urban identity, based on thinkers and pioneers in urban and anthropological thought: In the context of contemporary urban studies, the

concept of spatial memory is one of the basic pillars in understanding the relationship between humans and the city and understanding how individuals perceive and mentally retrieve their urban environment.

One of the most prominent contributions in this field is what Kevin Lynch. He developed an analytical framework for understanding urban space in his book, The Image of the City, classifying spatial components into five main elements: landmarks, edges, nodes, paths, and districts. These elements contribute to building the mental representation of the city and enhance individuals' ability to navigate and remember it, thus consolidating collective memory as a cognitive fabric rooted in space **(Lynch, 1960)**. Aldo Rossi presented in his Architecture of the City a conception of the city as a "factory of memory," where layers of time and collective experience are embodied in physical space through "urban artifacts"—such as public squares and memorial buildings—that carry accumulated social and cultural significance. He identified three fundamental axes for reading urban memory: morphological permanence, collective symbolism, and space as a container of time **(Rossi, 1982)**. For his part, Pierre Nora introduced the concept of places of memory (Lieux de Mémoire), emphasizing that collective memory is no longer preserved solely in daily practices, but rather requires material symbols to embody it as a result of the separation between humans and their living history. These places include old markets, public squares, religious monuments, and cultural centers as points where collective history and meaning are embodied **(Nora, 1989)**. In recent studies, Huebner and Dirksmeier presented a new cognitive-sensory perspective: spatial memory is not merely a physical form, but a multisensory experience comprised of sounds, smells, daily activities, and reciprocal social relations. Thus, the city transforms from an "urban object" into a "lived fabric," in which memory arises from continuous human interaction. A study shows that morphological transformations have gradually moved from organic patterns to more planned systems, with memory remaining in the main movement pathways **(Al-saaidy, 2020)**. Also, **(Cacciotti and Ferretti, 2020; Keightley and Pickering, 2023)** show that cultural memory is a living practice that integrates temporal, narrative, and spatial dimensions, emphasizing the importance of moving from “material preservation” to “moral preservation” based on experience, narrative, and symbolism. A study of contemporary Baghdad's transformations shows that the development of the street network was accompanied by continued perception and urban mobility across time **(Alobaydi and Rashid, 2024). (Zumelzu and Herrmann-Lunecke, 2023)** explain that urban identity today is constructed through socio-sensory interaction with place, and that effective urban regeneration should reproduce these relationships by designing spaces that enhance perception and belonging.

This trend complements the Islamic urban thought proposed by **(Hakim, 2007; Abdelmonem, 2016)**, which believes that the traditional urban fabric in Arab and Islamic cities is based on the principle of gradual privacy and the integration of functions between housing, worship, and work, which makes urban memory a product of living social practices rather than a fixed architectural form. This perspective also offers a critical reading of Western urban conservation frameworks, such as UNESCO policies, that focus on “formal normativity” in restoration, as excessive physical preservation divorced from lived experience may lead to the freezing of spatial memory rather than its revival.

Methodologically **(Ma et al., 2022)** developed a four-dimensional spatial identity indicator (belonging, distinctiveness, continuity, and context) as a quantitative-qualitative tool to measure the relationship between memory and identity in a historical environment.

**(Tadi et al., 2023; Lewicka, 2024)** also linked these dimensions to morphological analysis, asserting that the continuity of spatial fabric is linked to the extent to which collective memory is present in the perceptions of residents.

This model serves as a fundamental analytical framework for interpreting the relationship between urban form and social perception over time, and it is used in this research to analyze the three cases based on secondary sources and documentary maps. This is supported locally by the outputs of the Space Syntax of the Baghdad Center, which show the consistency of the integration and choice indices with the characteristics of perception and use **(Alsaffar, 2023; Alsaffar and Alobaydi, 2025).**

Accordingly, these dimensions can be detailed into several qualitative features that embody the presence of spatial memory across various levels in the historical urban fabric, as follows:

### 2.1 The Tangible (Physical) Dimensions of Spatial Memory in Historic Urban Fabric

This memory appears through several physical and functional features, including:

- Organic Urban Fabric: Reflects the integration between housing, work, and worship and expresses an accumulated contextual rationality **(Hakim, 2007).**
- Public Spaces: Such as squares and markets, as theatres for social interaction **(Abdelmonem, 2016).**
- Symbolic Landmarks: Such as mosques, towers, palaces, which constitute cognitive focal points **(Nora, 1989; Norberg-Schulz, 1980).**
- Repetitive Functions: The continuity of urban activities (such as weekly markets or seasonal celebrations) contributes to reactivating spatial memory in a live way and renewing the relationship between the population and the place **(Jacobs, 1961; Relph, 1976).**

In addition, morphological features are digitally analyzable using Space Syntax and DepthmapX tools, which display levels of spatial integration and choice as quantitative values that express the coherence and perceptual continuity of the tissue. Comparisons of urban block characteristics in Baghdad also demonstrate the applicability of morphometric measurement as an interpretive basis for reading spatial identity over time **(Al-saaidy and Alobaydi, 2021)**. Studies of Baghdad's master plan also show that the adoption of spatial technologies in its modernization is linked to the management of urban network gradation and traffic routes **(Hamad and Motlak, 2025).**

### 2.2 The Intangible Dimensions of Spatial Memory in Historic Urban Patterns

The intangible attributes, together with the physical dimensions, constitute a deep cultural and human dimension in understanding spatial memory. They embody the sensory and emotional experiences, social practices, and symbolic meanings that individuals and groups construct about their places (**Relph, 1976; Norberg-Schulz, 1980).**

- Cultural Symbols and Historical Narratives: They represent carriers of identity and collective memory **(Nora, 1989).**
- Sensory Perception: People perceive the city sensually through distinctive smells and familiar sounds, which constitute an element that contributes to building spatial memory and strengthening the individual's connection to the place **(Tuan, 1977; Porteous, 1985).**

- Social Rituals and Customs: Recurring social practices contribute to reproducing the human relationship with place through lived experiences that enhance the continuity of memory in daily life **(Jacobs, 1961; Abdelmonem, 2016).**
- Personal and Emotional Meanings: These stem from the individual connections that people form with specific places, which give the place a special emotional dimension in the spatial experience **(Relph, 1976; Lewicka, 2008).** In addition, the artistic-visual dimension of the urban landscape constitutes an active cognitive component of the identity of the place in the streets of Baghdad **(Ibrahim and Ashour, 2025).**

It is suggested that advanced cognitive analysis tools – such as Smellscape and Soundscape maps – be employed to document sensory dimensions in future studies, with this study focusing on the comparative analysis of spatial, symbolic, and social data.

### 2.3 Classification of Urban Memory Indicators

Based on the previous analysis, urban memory indicators can be classified into four interconnected categories representing formal, symbolic, social, and temporal dimensions. This classification forms the analytical basis for applying the comparative approach in the cities of Fez, Sarajevo, and Aleppo, relying on documentary analysis, historical maps, and academic sources. These indicators were field-tested in the Shawaka neighborhood of Baghdad, as a living fabric, to activate the relationship between comparative analysis and local reality.

- Morphological Indicators: It relates to the physical structure of the city, and includes urban fabric, street patterns, architectural features, and public spaces **(Lynch, 1960; Rossi, 1982; Tadi et al., 2023).**
- Symbolic Indicators: It relates to the meanings that a place carries, such as religious landmarks, historical names, and cultural and architectural symbols **(Nora, 1989; Norberg-Schulz,1980; Zumelzu and Herrmann-Lunecke, 2023).**
- Socio-spatial Indicators: It monitors the nature of daily activities, the continuity of traditional practices, and the extent of residents' interaction with the place **(Jacobs, 1961; Carmona et al., 2003; Ayad, 2020).**
- Temporal-Historical Indicators: It includes the extent to which a place retains its original characteristics and the continuity of its identity over time **(Rossi, 1982; Lynch, 1972; Lewicka, 2024).**

The following **Table 1** illustrates the characteristics of spatial memory, including its tangible and intangible dimensions, indicators, and their relationship to urban memory. This table shows the analytical indicators used within the analytical-interpretive framework, illustrating the relationship between the material and immaterial dimensions of spatial memory and its field measurement tools.

**Table 1.** Matrix of Spatial Memory Indicators in the Urban Fabric

| Classification | Main Attribute | Primary Indicator | Secondary Indicator | Measurement Method | Relationship to Urban Memory | References |
|---|---|---|---|---|---|---|
| Tangible | Organic Urban Fabric | Morphological | Fabric density | Spatial analysis (DepthmapX / Space Syntax) | Facilitates perception and enhances the legibility of the urban image | **(Lynch, 1960; Rossi, 1982; Hakim, 2007)** |
| | | | Street pattern | | | |
| | | | Degree of connectivity | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Public Spaces | Morpho – Social | Number of public spaces<br>Diversity of activities<br>Visual permeability | Map and document analysis | Acts as a stage for social interaction and strengthens collective memory | **(Carmona et al., 2003; Abdelmonem, 2016)** |
| | Symbolic Landmarks | Symbolic | Number of landmarks<br>Level of visual prominence<br>Cultural significance | Visual and documentary analysis | Forms strong cognitive anchors that enhance place perception | **(Nora, 1989; Norberg-Schulz, 1980)** |
| Intangible | Cultural Symbols and Narratives | Symbolic | Spread of local narratives | Textual and semiotic analysis | Embeds cultural meanings within space as carriers of identity | **(Nora, 1989; Relph, 1976)** |
| | Sensory Perception | Sensory | Diversity of sounds, smells, and colors<br>Degree of residents' sensory association | Qualitative perceptual analysis | Stimulates subconscious memory and emotional attachment | **(Tuan, 1977; Porteous, 1985)** |
| | Social Rituals and Customs | Socio – Spatial | Number of recurring rituals<br>Level of community participation | Behavioral and comparative analysis | Reproduces spatial memory through collective activity | **(Jacobs, 1961; Abdelmonem, 2016)** |
| | Personal and Emotional Meanings | Psycho – Spatial | Degree of place attachment | Sociological / Survey analysis (in Al-Shawaka) | Creates personal bonds that strengthen spatial identity | **(Relph, 1976; Lewicka, 2008)** |
| Tangible + Intangible | Continuity of Historical Characteristics | Temporal – Historical | Percentage of original buildings<br>Degree of transformation | Comparative analysis of historical maps and documents | Ensures the sustainability of memory across time and space | **(Rossi, 1982; Lynch, 1972)** |

## 3. METHODOLOGY

This research adopts a descriptive-analytical-comparative approach with an applied nature, integrating the fields of urban design, spatial memory, and cultural heritage preservation. It aims to analyze the relationship between urban revitalization strategies and the restoration of memory and identity, by comparing three historic cities (Fez, Sarajevo, and Aleppo), and applying the resulting indicators to the Shawaka neighborhood in Baghdad to verify their validity. The approach combines qualitative and structural spatial analysis using DepthmapX, sociospatial analysis of behavior and use in public spaces, and a cognitive-symbolic analysis based on the work of Lynch, Rossi, and Nora.

Fieldwork included a questionnaire and direct observations to document patterns of interaction and use, while comparative analysis was based on secondary sources. The

study's boundaries were spatially defined by three global cities (Fez, Sarajevo, and Aleppo) and one local city (Al-Shawaka, Baghdad). The study's timeframe was between 2000 and 2025, and its methodological scope was limited to the Al-Shawaka neighborhood only. This approach resulted in the construction of an integrated analytical-interpretive framework that links urban form, human behavior, and symbolic meanings. This approach enabled theoretical indicators to be tested in practical realities and demonstrated the potential for urban revitalization based on memory and identity in historical environments.

## 4. COMPARATIVE ANALYSIS OF CITIES

This analysis is based on a comparative approach to assessing strategies for reviving spatial memory in three historic cities – Fez, Sarajevo, and Aleppo – with the aim of extracting morphological, symbolic, and socio-temporal indicators and subsequently applying them to the Shawaka neighborhood in Baghdad.

### 4.1 Fez – Morocco

Fez el-Bali is one of the most complete models of spatial memory preservation in the Islamic world, representing a morphological continuity within historic cities. Spatial and documentary analyses have shown that the city adopted an integrative restoration approach that links the physical, symbolic, and social structures, particularly after the implementation of the Lalla Yeddouna Square project, which improved spatial accessibility and revitalized the historic center **(Ayad, 2020; UNESCO, 2018).**
Symbolically, central landmarks such as the Qarawiyyin Mosque and the Attarine Souk were preserved as carriers of collective memory, strengthening cultural identity through formal and functional continuity **(UNESCO World Heritage Centre, 2021).**
Socially, the rehabilitation contributed to the restoration of civic and cultural activity in public spaces, reflecting a direct relationship between memory and daily practice **(UNESCO World Heritage Centre, 2020).**
Chronologically, **(ICOMOS, 2019)** reports that more than 75% of the historic fabric has been preserved unchanged, making Fez a model of urban permanence based on a delicate balance between transformation and continuity.

### 4.2 Sarajevo – Bosnia and Herzegovina

Sarajevo represents a model for the reconstruction of spatial memory in post-conflict contexts. Urban revitalization efforts following the 1990s war represented a unique experiment in memory restoration as a tool for reconciliation. Reconstruction strategies were based on a dual approach that combined symbolic restoration with morphological construction, targeting landmarks such as the City Hall (Vičnica), Bascarsija Square, and the Latin Bridge **(UNESCO, 2004; Čaldarović and Galjer, 2012**). Morphologically, historical movement networks were reconfigured to maintain permeability, while symbolic dimensions focused on utilizing monuments as sites of collective healing memory **(Lamphere-Englund, 2015).** Socially, renovated public squares helped foster civic interaction and cultural expression, restoring the city to its open social space.
Temporally, some traces of destruction were preserved as "material testimonies" within the concept of reconciled memory, making Sarajevo a laboratory for the coexistence of material and symbolic memory.

### 4.3 Aleppo – Syria

Old Aleppo reflects a complex process of reproducing memory amidst destruction and reconstruction. Data from **(Spatial Research Center, 2016)** indicate that more than 60% of the urban fabric was damaged during the war, yet revitalization efforts focused on restoring functional memory through the reconstruction of historic markets and iconic centers such as the Umayyad Mosque and the Citadel of Aleppo **(UNESCO, 2019).**

Morphologically, the restoration of markets and public spaces represented a means of reshaping collective memory through space. Symbolically, the distinctive elements of the city's visual identity were preserved, while the remaining traces of destruction represented "documentary temporal layers" that confirm the concept of overlapping memory **(UNESCO, 2023).**

Socially, revitalization processes were accompanied by a gradual return to daily activities and local markets as an indicator of renewed urban life. Aleppo's experience confirms that urban revitalization, in post-war contexts, is not limited to physical reconstruction but extends to the reconstruction of meaning across time as a tool for restoring collective identity.

Based on the previous analysis, a comparative matrix of morphological, symbolic, and socio-temporal dimensions was constructed, with the aim of identifying patterns of urban revitalization and types of spatial memory continuity in each city. These results represent a standard basis for applying analytical indicators in a field study of the Shawaka neighborhood in Baghdad, to test the extent to which the local model aligns with global trends in preserving memory and identity within historical environments. As shown in **Table 2**, the patterns of spatial memory revival differ among the three cities across four analytical dimensions: morphological, symbolic, socio–spatial, and temporal–historical.

**Table 2.** Comparative Analytical Framework of Spatial Memory Dimensions in Fez, Sarajevo, and Aleppo

| Analytical Dimension | Fez | Sarajevo | Aleppo |
|---|---|---|---|
| Morphological | Stable organic continuity | Partial functional reconstruction | Gradual reconstruction after destruction |
| Symbolic | Preserved historical symbols | Revived symbols as national identity | Restored symbols as sources of cultural cohesion |
| Socio–Spatial | Renewed social interaction in public spaces | Civic and cultural activity in central squares | Gradual return of community interaction |
| Temporal–Historical | Continuous temporal persistence | Reconciled memory with conflict | Layered memory between destruction and restoration |

The comparison indicates that the urban resilience of memory is determined by the integration of morphological, symbolic, and social dimensions. Fez represents a model of historical continuity, Sarajevo a model of post-conflict revitalization, and Aleppo a model of renewed reconstruction. From these cases, analytical indicators are extracted and used to interpret the results of the applied study in the Shawaka neighborhood of Baghdad, relying on spatial analysis tools (DepthmapX) and field community analysis (questionnaire), as shown in **Table 3.** These indicators summarize the dimensions and the mechanisms for their employment within digital and field analysis tools.

**Table 3.** Extracted analytical indicators of spatial memory and their application in Al-Shawaka District

| Dimension | Key Indicators | Extracted Outcomes for Application in Al-Shawaka District |
|---|---|---|
| Morphological | Spatial connectivity | Identifying spatial integration levels through DepthmapX maps and assessing the compatibility between density, morphology, and current land uses. |
| | Density | |
| | Permeability | |
| | Continuity of the historical fabric | |
| Symbolic | Prominence of landmarks | Mapping urban landmarks and spaces that carry collective meanings and utilizing them as reference points in redesigning spatial identity. |
| | Cultural symbols | |
| | Visual memory | |
| Socio–Spatial | Nature of activities | Analyzing the relationship between human activity and public spaces to trace the continuity of local practices in Al-Shawaka. |
| | Daily rituals | |
| | Interaction in public spaces | |
| Temporal–Historical | Continuity of use | Employing historical maps and oral interviews to track the evolution of collective memory across periods of urban change. |
| | Morphological transformation | |
| | Temporal documentation | |

These indicators represent the integrated summary of the comparative analysis and form the frame of reference upon which the stages of applied analysis will be built in the Al-Shawaka neighborhood in Baghdad, within the methodology of urban revitalization based on memory and identity in historical environments. The experience of the Al-Rusafa Center indicates that activating historical symbols and heritage facades represents a pillar of the center's identity and guides the direction of spatial revitalization priorities **(Hasan, 2023).**

## 5. APPLIED URBAN ANALYSIS OF AL-SHAWAKA DISTRICT

The Shawaka neighborhood is one of the most important historical urban fabrics in Baghdad, characterized by its organic character, reflecting the interplay of traditional morphology and inherited social practices as shown in **Fig. 1**.

**Figure 1.** The location of Al-Shawaka neighborhood in the city of Baghdad (Source: Google Earth, prepared by the researcher, 2025).

This analysis aims to uncover the nature of the relationship between urban form and the social and cognitive behavior of residents by combining the results of digital spatial analysis using DepthmapX and the results of a field survey designed to measure belonging, identity, spatial justice, and community participation. The analysis is based on theoretical indicators derived from benchmark experiments in Fez, Sarajevo, and Aleppo, and field testing in Shawaka as a living model of spatial memory in a contemporary urban context. The results of the spatial analysis using DepthmapX revealed a clear hierarchy in the network of urban spaces, as shown in the following **Table 4 and Fig. 2**.

**Table 4.** Morphological Indicators – Al-Shawaka (DepthmapX)

| Indicator | Minimum | Mean | Maximum |
|---|---|---|---|
| Integration HH | 0.373277 | 0.65356 | 0.953589 |
| Connectivity | 1 | 2.70833 | 10 |
| Choice (Norm n) | 0.000 | 0.0928633 | 0.736383 |

**Figure 2.** Spatial integration map (Integration HH) in Al-Shawaka neighborhood (Source: prepared by the Authors using DepthmapX program, 2025).

The spatial integration map shows a clear gradient between the main axes and the internal alleys. The highest values (Integration ≥ 0.8) are concentrated in the streets leading to the local market and the riverfront, reflecting the connection of the morphological structure of movement to the centers of commercial and social activity, while the values decrease within the closed residential alleys, consecrating privacy and relative isolation see **Fig. 3**. The map shows the level of connectivity between the movement axes in the urban fabric of the Shawaka neighborhood see **Fig. 4.** The red lines represent the highest spatial connectivity values, indicating that they are main, highly permeable corridors that facilitate movement and access between neighborhood components. In contrast, the blue lines reflect areas of low connectivity, characterized by internal residential characteristics and high privacy. The results show that the neighborhood's street structure is characterized by a clear gradation from public axes to local alleys, reflecting the traditional compact pattern that combines

functional openness at the edges with social privacy within. The Visual Integration HH map shows that the most open and visually perceptible spaces are distributed around the central square and main axes, while the internal alleys show a significant decrease in visual values (≤ 0.3), reflecting a closed perceptual pattern consistent with the nature of traditional housing.

**Figure 3.** Connectivity map in Al-Shawaka neighborhood (Source: prepared by the Authors using DepthmapX program, 2025).

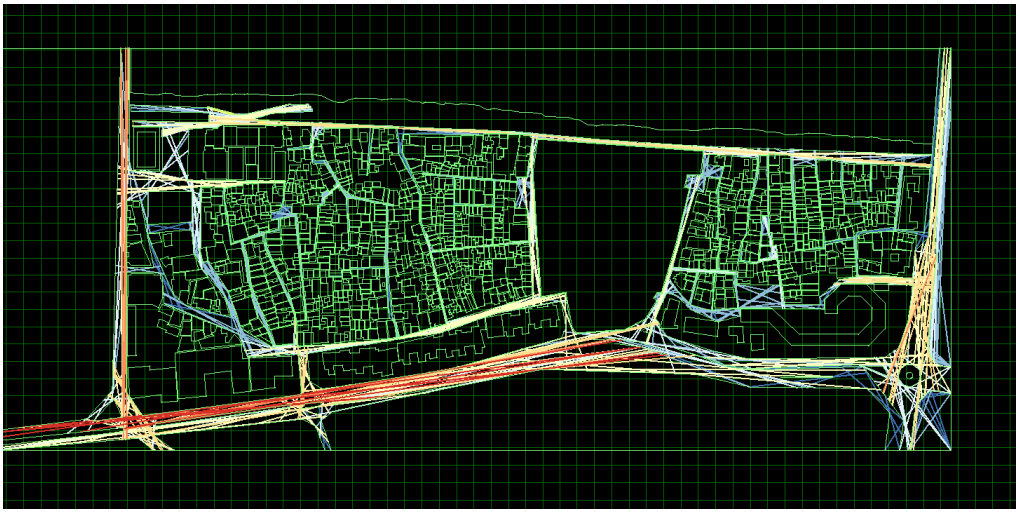

**Figure 4.** Visual Integration HH map in Al-Shawaka neighborhood (Source: prepared by the Authors using DepthmapX program, 2025).

The values show that the highest levels of spatial integration (Integration ≥ 0.9) are concentrated in the passageways leading to the main market, the mosque, and the central square, areas that represent cognitive-motor centers for daily activity, making them repositories of spatial memory. The internal alleys with lower values (Integration ≤ 0.4 and Connectivity ≤ 2) reflect a private residential nature, enshrining social privacy and reproducing neighborhood ties within an organic system balanced between public and private. These results confirm that the morphological structure of the Shawaka area is still capable of supporting patterns of collective behavior and preserving the identity of the place despite recent transformations.

As for the socio-statistical analysis, it was based on a field questionnaire that included (52) residents of the neighborhood, distributed according to gender, age, education, and type of residence, and relied on the matrix of behavioral-spatial indicators derived from the theoretical framework. The results of **Table 5** show that the highest mean was recorded in the community participation axis (M = 4.26, SD = 0.63), followed by social interaction and trust (M = 4.12, SD = 0.71), while the lowest values were recorded in spatial justice (M = 2.41, SD = 0.81). While **Fig. 5** visually illustrates these differences through a bar chart, which highlights the disparity between the axes related to social cohesion and those related to infrastructure and services.

**Table 5.** Descriptive Statistics per Dimension (n = 52)

| Axis | Mean (M) | SD |
|---|---|---|
| Place Attachment & Belonging | 3.94 | 0.68 |
| Social Interaction & Trust | 4.12 | 0.71 |
| Visual Perception & Spatial Experience | 3.57 | 0.74 |
| Cultural Symbols & Identity | 3.81 | 0.66 |
| Local Materials & Urban Form | 3.69 | 0.72 |
| Spatial Justice & Vulnerable Groups | 2.41 | 0.81 |
| Economic Activities & Informal Use | 2.89 | 0.77 |
| Community Participation & Local Knowledge | 4.26 | 0.63 |
| Infrastructure & Services | 2.73 | 0.85 |

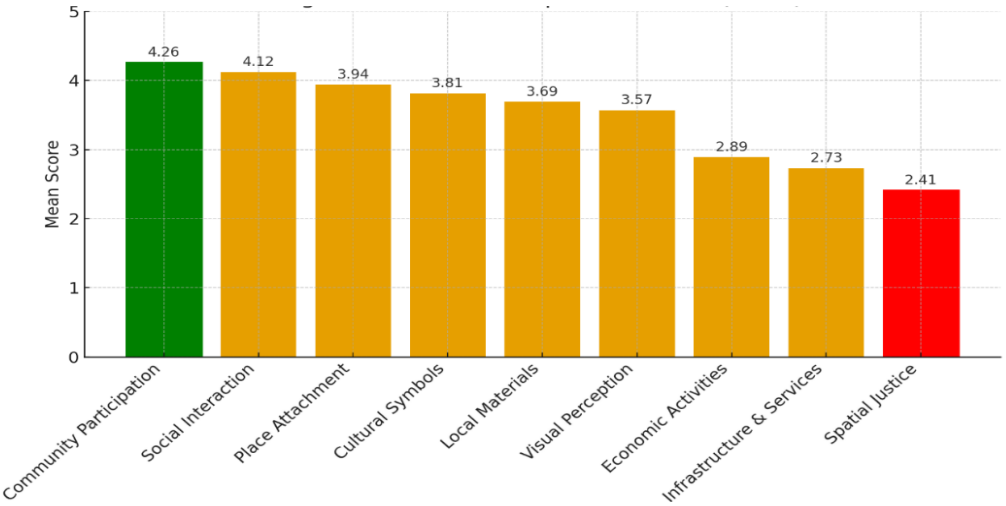


**Figure 5**. Average indicators of spatial and social identity dimensions in Al-Shawaka neighborhood

This finding suggests that community participation and local knowledge are a generative source for reshaping urban space, in line with that proposed by **(Alexander, 1979)** about

patterns emerging from daily practices, and that emphasized by **(Gehl, 2010)** regarding the pivotal role of human behavior in generating urban design. This was followed by the axis of social interaction and trust (M = 4.12), which highlights the cohesion of the social structure and the continuity of neighborhood ties, while cultural symbols and identity (M = 3.81) and visual perception (M = 3.57) showed a medium to high presence, indicating the continuity of visual and symbolic features such as shanasheel, narrow alleys, and earthy colors that act as a cognitive mediator of memory. In contrast, spatial justice (M= 2.41) and services (M= 2.73) recorded the lowest values, reflecting organizational gaps that limit the sustainability of quality of life. Local literature highlights the need for gradual structural interventions in deteriorating neighborhoods to ensure the sustainability and equity of services **(Hadi and Mutlak, 2018).** Statistical results showed that all reliability coefficients ($\alpha > 0.70$) fell within the acceptable range see **Fig. 6**, with KMO = 0.82 and Bartlett's test significance ($p < 0.001$), confirming the validity and robustness of the instrument. A positive relationship was also found between ownership and spatial belonging ($p < 0.05$) and between community participation and belonging ($r = 0.41$, $p < 0.01$) as shown in **Fig. 7.**

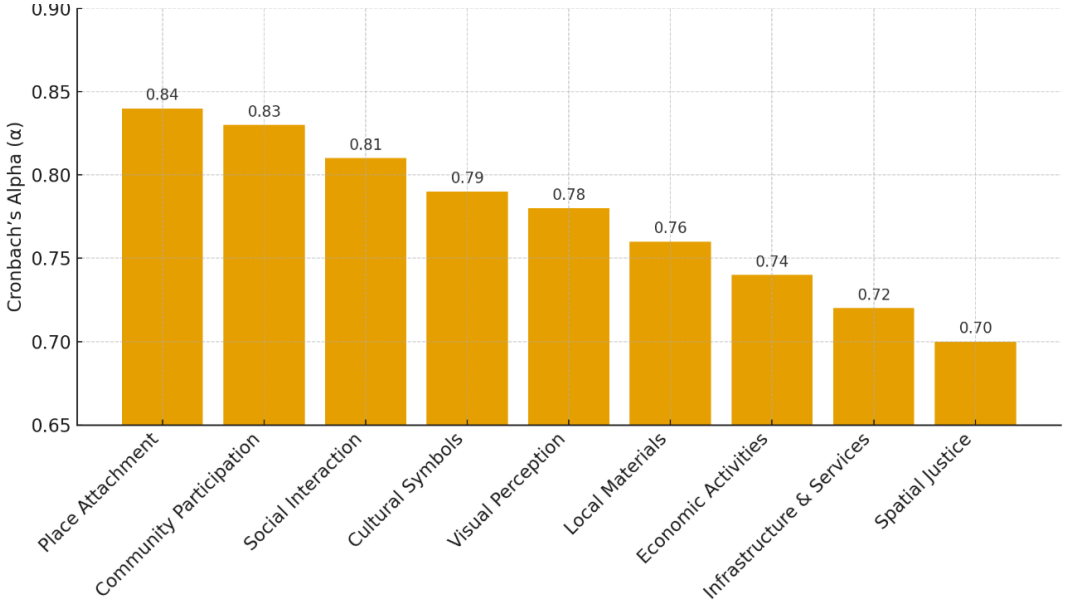


**Figure 6.** Internal consistency coefficients (Cronbach's alpha) for the questionnaire axes in Al-Shawaka neighborhood.

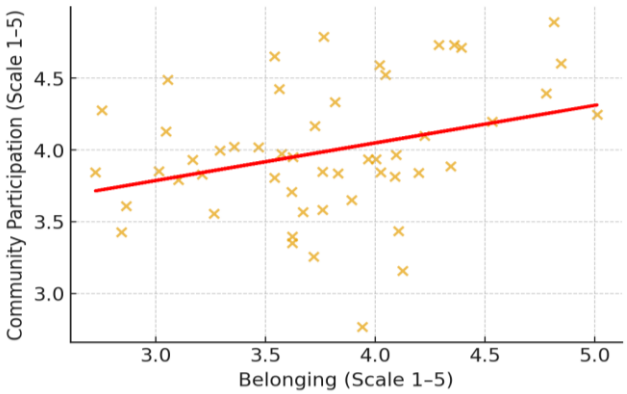


**Figure 7.** The relationship between community participation and spatial belonging in Al-Shawaka neighborhood.

Integrating morphological and social analyses reveals that areas with high integration values (≥ 0.8) correspond to areas of the most intense social and economic activity, particularly near the central market and Shawaka Mosque, where collective memory is embodied through daily practices. This result is consistent with readings of the dynamics of central Baghdad, which show that areas of higher integration are associated with a concentration of trans-day urban activities **(Alsaffar, 2025).**

Areas with low integration, on the other hand, serve as spaces of residential privacy and inherited family relationships, reflecting a socio-spatial structure balanced between openness and belonging. This relationship confirms that urban identity is not merely a product of physical form, but rather the continuous interaction between space, behavior, and symbols that reproduce sensory memory over time.

The results of the Shawaka neighborhood highlight a set of design implications, most notably the need to redistribute services and infrastructure along the most integrated axes to achieve spatial justice, and to activate symbolic points (mosque, square, shanasheel) as living memory elements that reinforce collective identity. Additionally, the local community should be integrated into generative design projects through participatory workshops and the organization of informal economic activities in corridors with the highest Choice values within a sustainable framework. Preserving local materials and visual features is also an essential part of sustaining spatial perception and memory.

The Shawaka experience reveals that the historical morphological fabric remains effective in generating sustainable behavioral and social patterns, and that the local community constitutes a generative axis in urban revitalization processes. However, achieving a balance between identity and openness requires promoting spatial justice and improving services, transforming spatial memory from a mere historical relic into a living urban energy that reproduces identity through participation and generative design.

## 6. RESULTS AND DISCUSSION

The results of field analysis in the Shawaka neighborhood show that spatial memory remains present in the urban structure and social behavior, despite the material and service changes the neighborhood has witnessed in recent decades. The balance of spatial integration (Integration ≈ 0.8) and cohesive social ties reflects the increased capacity of the organic fabric to absorb transformations without losing its historical identity. This intersects with the concept of "living fabric" proposed by **(Hakim, 2007)** and confirmed by **(Alexander, 1979).** The alignment of the highest integration zones with centers of social activity (market, mosque, square) indicates that urban memory is embodied through the daily use of space, not through form alone. This is consistent with the view of **(Relph, 1976; Lynch,1960)** that space is perceived through sensory experience and recurring meaning in everyday practice. It also demonstrates that human behavior represents a generative engine for the reproduction of identity, rather than merely a reflection of physical form.

In contrast, the contrast between high spatial belonging (M=3.94) and low spatial justice (M=2.41) revealed a gap between emotional attachment to place and justice in the distribution of services, which calls for adopting a generative design approach that restores the balance between belonging and spatial justice, as emphasized by **(Carmona et al., 2003; Ma et al., 2022).** Compared to the reference cities, Fez demonstrates a model of morphological continuity, Sarajevo a model of post-conflict symbolic revival, and Aleppo a model of post-destruction reconstruction. Meanwhile, Shawaka represents a model of "living memory" recovered from within through daily community practice. This finding reinforces

the central hypothesis of the research: spatial memory is not a static property, but rather a dynamic system shaped by the interaction of structure, behavior, and symbol within a constantly evolving temporal framework. The integration of spatial and social analyses confirms that identity preservation is achieved not only through physical form but also through repurposing space as a platform for human interaction. Therefore, generative design based on participatory design and spatial data represents an effective tool for reviving historical urban patterns and sustaining memory within contemporary contexts.

## 7. CONCLUSIONS

The study's results confirm that spatial memory in historical environments is not a static visual heritage, but rather a dynamic urban system comprised of the ongoing interaction between morphological structure, human behavior, and cultural symbols. Applied analysis in the Shawaka neighborhood of Baghdad demonstrated that the traditional organic fabric remains effective in generating sustainable behavioral and social patterns, and that its continuity represents a vital urban resource for reviving spatial identity and strengthening collective belonging. The study adopted the four-dimensional spatial identity index to assess the dimensions of belonging, distinctiveness, continuity, and context, emphasizing that generative design supported by digital tools such as DepthmapX can serve as an effective medium for reviving spatial memory through participatory design models based on community interaction. Comparisons with Fez, Sarajevo, and Aleppo also demonstrated that the success of urban revitalization strategies is linked to their ability to integrate historical symbolism with spatial justice, transforming heritage from a physical entity into a renewed living experience. The results revealed a clear gap between the strength of spatial belonging and the weakness of spatial justice and services. This calls for design and policy interventions that redistribute resources and enhance community participation as a generative component of the revitalization process. They also highlight that the revitalization of spatial memory represents an effective pathway for the renewal of historic cities, where heritage is transformed from a material artefact into a generative system of identity, belonging, and sustainable urban development. The limitations of the research include the fact that fieldwork was limited to the Shawaka neighborhood and that it relied on secondary data to study reference cases. This calls for expanding the scope of field analysis in the future to other cities and incorporating elements of post-conflict and displacement memory into socio-spatial and cognitive analysis.

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## Credit Authorship Contribution Statement

Shaymaa Abd Alqader Ameen: Conceptualization, methodology, formal analysis, writing-original draft, validation. Zaynab Radi Abaas: Supervision, review, editing, validation.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# الإحياء الحضري للذاكرة المكانية: نحو استعادة الهوية في المدن المعاصرة

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**الخلاصة**

يشهد النسيج الحضري في المدن المعاصرة تراجعًا في الذاكرة المكانية والهوية الجمعية نتيجة التحولات السريعة في الشكل والسلوك الحضري. ينطلق هذا البحث من فرضيةٍ مفادها أن استمرارية البنية المورفولوجية وتكاملها المكاني يعززان الإدراك والانتماء المكاني، وأن هذا الترابط يشكّل المحرك الأساس لإحياء الهوية الحضرية. تعتمد الدراسة منهجًا تحليليًا–مقارنًا يدمج بين التحليل المكاني الرقمي باستخدام برنامج DepthmapX، والتحليل الاجتماعي عبر استبيانٍ ميداني للسكان، ضمن إطارٍ تطبيقي يقارن بين ثلاث مدن تاريخية تمثل أنماطًا مختلفة لإحياء الذاكرة المكانية: فاس التي حافظت على ترابط نسيجها العضوي واستمراريته التاريخية، وسراييفو التي أعادت بناء رموزها الجمعية من خلال ترميم المعالم والساحات العامة، وحلب التي أظهرت استمرارية محدودة في البنية المورفولوجية مقابل حضور قوي للذاكرة الرمزية والوظيفية. اختُبرت الفرضية من خلال تحليل العلاقة بين مؤشرات الاندماج المكاني ومحاور الإدراك والانتماء في الاستبيان، مما أكد الترابط بين الشكل الحضري والممارسة الاجتماعية كآلية لإحياء الذاكرة المكانية. وتقترح الدراسة إطارًا تصميميًا تشاركيًا يدمج الأدوات الرقمية مع المعطيات المجتمعية لتعزيز استمرارية الذاكرة والهوية الحضرية في المدن التاريخية المعاصرة، مؤكدةً أن إحياء الذاكرة المكانية يُعد مدخلًا أساسيًا للتنمية الحضرية المستدامة وسياسات الحفاظ المستقبلية.

**الكلمات المفتاحية:** الإحياء الحضري، التحليل المكاني الرقمي، الذاكرة المكانية، الهوية الحضرية، المشاركة المجتمعية.