

Elucidating the Structural Relationships of In-Between Spatial Systems in Relation to Presence Quality: A Multi-Layer Perceptual–Spatial Configuration Approach (Case Study: Qeysarieh District, Isfahan Bazaar)

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Abstract

This research examines the role of in-between spatial systems in enhancing presence quality, taking the Qeysarieh precinct of the Isfahan Bazaar—one of the principal connectors between Naqsh-e Jahan Square and the historic bazaar network—as the study area. The precinct was selected owing to its high density of pedestrian flows, adjacency to tourism–service–commercial land uses, and diversity of intermediary spatial elements. The study adopted a mixed-methods (quantitative–qualitative) approach. In the quantitative component, perceptual data from 351 users regarding four dimensions—environmental, physical, functional, and psychological—were collected through a standardized questionnaire and analyzed using the one-sample t-test and Friedman test. In the qualitative component, the spatial structure was evaluated through a space-syntax approach at four levels: axial analysis (Integration, Choice, Mean Depth), visibility analysis (VGA) and isovists, agent-based simulation, and assessment of overall intelligibility. Quantitative results indicated that psychological, functional, and environmental dimensions were assessed above baseline, whereas the physical variable showed no significant difference. Syntactic analysis showed that the Zarrabkhaneh route and Qeysarieh Chahar-Suq exhibited the highest centrality and distributive roles, and that chahar-suqs exerted greater influence on movement and stopping than corridors. The low coefficient of determination for intelligibility ($R^2 = 0.11$) indicates a need to improve perceptual guidance within secondary networks. Integrating quantitative and qualitative findings suggests three principal strategies whose implementation, by aligning form, function, and perception, can increase the sustainability of presence quality and enhance user experience within historic urban fabrics.

Keywords: In-Between Spatial Systems; Presence Quality; Public Realms; Traditional Bazaar of Isfahan – Qeysarieh Precinct

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1. Introduction

Presence quality—defined as the capacity of an urban environment to attract, sustain, and enrich human interactions—encompasses the ability to facilitate social activities and foster a sense of belonging and vibrancy (Qi, Mazumdar, & Vasconcelos, 2024; Kamani Fard & Paydar, 2024). Within this framework, in-between spatial systems—intermediary layers linking public and private domains, including transitional spaces, circulation routes, intermediary zones, and interactive realms—play a pivotal role in reinforcing presence quality by structuring spatial connections and enabling purposeful social encounters (Lin & Chang, 2025; Gao & Liu, 2023). Physically, these systems often materialize in elements such as *raasteh* (linear bazaars), passageways, *chahar-suqs* (traditional four-way intersections), entrances, and forecourts (Noghrekar et al., 1999; Balilan Asl & Satarzadeh, 2015). At the perceptual level, they define and mediate mental boundaries between public and semi-public spaces, shaping users' spatial understanding and experience (Jackson & Brown, 2023; Turner & Harris, 2023).

Traditional Iranian bazaars, as exemplary cases of historic public realms, provide a robust setting for examining perceptual-configurational interactions due to their unique physical structure, compact spatial sequences, and intricate network of passageways and in-between spaces (Jalali, Hosseini, Yeganeh, & Bamanian, 2021). Within this context, the Qeysarieh precinct of the Isfahan Bazaar—serving as a pivotal gateway linking Naqsh-e Jahan Square to the city's historic bazaar network via the “Qeysarieh Gate” and the main Qeysarieh axis—holds a distinguished status. This precinct, characterized by a complex physical continuity, intrinsic spatial order, and overlapping historical layers (Pahlevan & Habib, 2023), as well as a high concentration of spatial nodes and junctions (including major *chahar-suqs*, *caravanserais*, and adjacent *timchehs*), represents an ideal case for analyzing the role of in-between spatial systems in shaping patterns of presence and movement. Moreover, the integration of tourism, service, and commercial functions within a continuous network—particularly around the Qeysarieh forecourt and along its active *raastehs*—offers exceptional potential for investigating spatial-social interactions at both micro and meso scales (Pahlevan, Salianzadeh, & Habib, 2022; Soltanzadeh, 2024).

Despite these capacities, a set of contemporary challenges has affected the quality of presence within the Qeysarieh precinct. These include: diminished legibility resulting from heterogeneous physical interventions and visual clutter along *façades* and signage (Chen & Roberts, 2024); reduced environmental comfort during peak hours due to high pedestrian density and the inefficiency of movement and pause-supporting infrastructure (Smith & Johnson, 2023); and the weakening of place identity caused by the dominance of commercial activities poorly aligned with the historic fabric (Jackson & Brown, 2023). Such challenges can undermine the continuity of movement experiences, the quality of pauses at key nodes (such as *chahar-suqs* and the Qeysarieh forecourt), and the perception of boundaries between public and semi-public spaces (including entrances to *caravanserais* and *timchehs*), ultimately reducing the overall desirability of presence in the precinct. Accordingly, rethinking spatial design and management strategies with a focus on the “in-between spatial systems” of this area is essential.

Based on this premise, the objective of this study is to evaluate and analyze the impact of in-between spatial systems on key presence quality indicators within the Qeysarieh precinct of the Isfahan Bazaar. The central research questions are:

- What are the most significant components and elements influencing presence quality in the Qeysarieh precinct (with emphasis on main raastehs, major chahar-suqs, the Qeysarieh forecourt, and entrances to caravanserais/timchehs)?
- How can the variables and components affecting presence quality be identified, measured, and prioritized within the Qeysarieh’s in-between spatial systems to inform design and management interventions?

The research process is structured into four stages: definition, evaluation, refinement, and formulation. Each stage—drawing upon theoretical foundations and literature, field data analysis, extraction of practical solutions, and synthesis—shapes the pathway to the study’s outcomes. The overall framework is organized into two dimensions: theoretical (the “what” and “how”) and practical (the implementation method). This structure guides the progression from problem identification in the Qeysarieh precinct to the development of strategies for enhancing presence quality. The interaction between these components is illustrated in Figure 1.

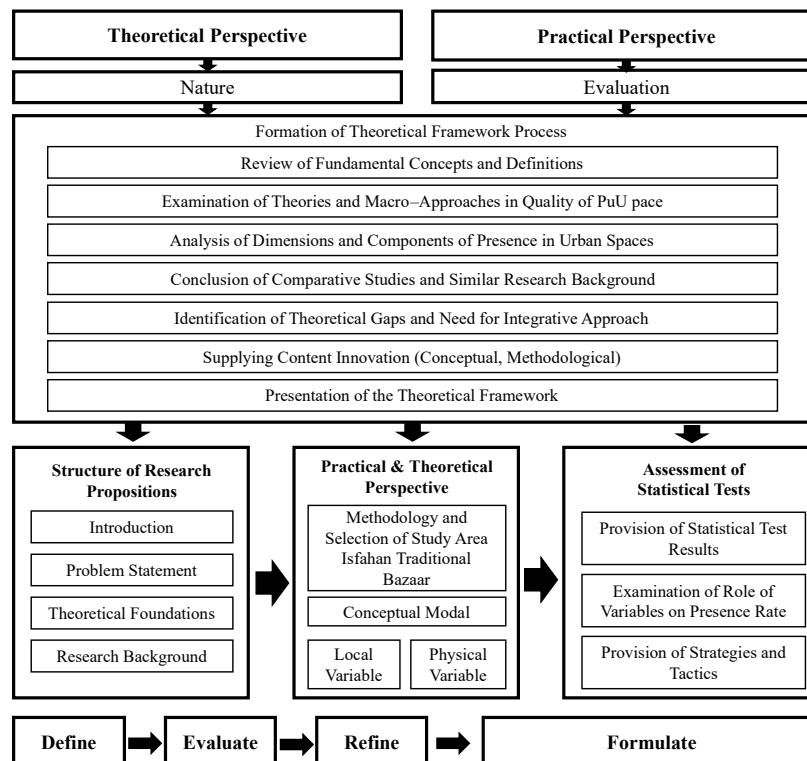


Figure 1. Conceptual model of the research

2. Theoretical Foundations and Literature Review

In the fields of architecture, urban design, and environmental psychology, the concept of *presence* refers to the quality of active, perceived, and meaningful engagement of individuals within public spaces (Anderson et al., 2024). This concept goes beyond mere physical occupancy or counting the number of people in a space, encompassing perceptual, psychological, functional, and social

dimensions as well (Barranco Merino et al., 2023; Samavati, 2022). In recent years, presence has been widely recognized as a multidimensional criterion and one of the key indicators for assessing the quality of urban environments (John et al., 2025). The following section reviews various perspectives, analyzes the theoretical dimensions of presence, and establishes the conceptual groundwork for the research framework.

Scholars such as Poulsen (2023), Greenwich (2022), and Brown (2022) argue that presence emerges when the urban environment enables spontaneous interactions, voluntary pauses, and flexible use of space. They emphasize the importance of places that support diverse activities and, from a functional standpoint, respond to users' everyday needs through services, amenities, and adequate accessibility (Hidalgo & Hernández, 2022; Zhao et al., 2023). Furthermore, the adaptability of the environment to diverse behavioral patterns, spatial flexibility, and the provision of infrastructures that support human interaction are identified as key attributes that encourage voluntary user retention in a space (Silva & Costa, 2022; Smith & Johnson, 2024). In other words, sustainable presence occurs when the physical–functional setting aligns with users' needs and lifestyle patterns (Marquet & Miralles-Guasch, 2023).

Conversely, studies such as Kowler (2022) and Hoffmann (2023) place greater emphasis on the psychological, perceptual, and symbolic dimensions of presence. From this perspective, space is not merely a physical setting but an *experienced place* imbued with meaning and collective memory—where sense of place, spatial identity, and emotional attachment foster sustained engagement (Lewicka & Manzo, 2022). Physical and visual cues, comprehension of spatial codes, and the evocation of belonging contribute to psychological security, comfort, and vitality, thereby enhancing active participation (Kim & Kaplan, 2023; Qian et al., 2024). This perceptual connection is particularly critical in historic public spaces, where cultural and symbolic value plays a vital role in maintaining presence quality (Carmona, 2021; Riccardi & Ventura, 2024).

In this regard, theorists such as Oldenburg (1999), Jacobs (1961), and Habermas (1962) adopt a more structural view, highlighting the importance of functional harmony with the built form and activities in public spaces (Can & Heath, 2024). They argue that spaces with high presence quality possess coherent structure, intelligible movement paths, appropriate sightlines, human-scaled proportions, and opportunities for collective activities (Sharifi & Murayama, 2021; Rojas & Páez, 2022).

Within this discourse, the role of *in-between spatial systems*—including passageways, chahar-suqs (crossroads), gateways, iwans, and other transitional spaces—has often been overlooked, despite their function as transitional nodes (Gehl, 1987; Salama & Wiedmann, 2020) that enhance spatial cognition (Lee & Choi, 2022; Rapoport, 1977), facilitate movement (Gao & Liu, 2023; Hillier, 2007), and create points for pause and interaction (Oldenburg, 1999; Carmona, 2021). Recent studies reveal that, due to their intermediary position, these systems provide a suitable context for linking public and private realms, improving legibility, and fostering user attachment and comfort (Lee & Choi, 2022; González & Balsas, 2023). However, these theories have been revisited by contemporary approaches that caution against excessive focus on spatial order and physical form without adequate consideration for user behavioral patterns and adaptive needs. Such one-dimensional designs can produce inefficient, rigid, and uninviting spaces (Riccardi & Ventura, 2024; Zhao et al., 2023). Designs that overlook functional diversity, actual movement patterns, and perceptual preferences often fail to foster a sense of invitation and voluntary participation (Huang et al., 2021; Park & Kim, 2024). This is particularly evident in historic spaces where mismatched interventions or formalist redesigns have disrupted

spatial quality. Thus, recognizing both the capacities and limitations of the physical–functional context, alongside rethinking linear and static design models, is essential to developing a holistic approach to presence. Accordingly, none of the existing approaches alone can fully explain presence in complex urban settings—particularly within the Qeysarieh precinct of the Isfahan Bazaar, a historic public realm with a bottleneck spatial structure. A critical review of past studies reveals that environmental, physical, functional, and psychological dimensions have often been examined separately, or their interconnections have been overlooked. In Qeysarieh, however, presence results from the intricate, synergistic interaction of these dimensions at both micro and meso scales: from the spatial configuration of the Qeysarieh axis and the role of chahar-suqs and forecourts in movement distribution and pause-space formation, to the perceptual quality of public–semi-public thresholds at caravanserai/timcheh entrances, and the environmental conditions influencing the experience of being present. This theoretical gap—particularly concerning Qeysarieh’s in-between spatial systems—underscores the need for an integrated, conceptually refined approach.

In response, this study focuses on the in-between spatial systems of the Qeysarieh precinct, adopting an integrated, structured, and multi-layered analytical lens to examine the interacting factors influencing presence. The study’s novelty lies in presenting a coherent framework that systematically explores the relationship between in-between systems (main raastehs, key chahar-suqs, forecourts, and caravanserai/timcheh entrances) and the four dimensions of presence, grounded in contemporary theoretical and empirical literature. This integrated conceptual framework (Figure 2) provides a precise and comprehensive basis for analyzing and prioritizing presence components in Qeysarieh, enabling a more accurate and applicable understanding of how in-between spatial systems contribute to enhancing presence in this historic precinct.

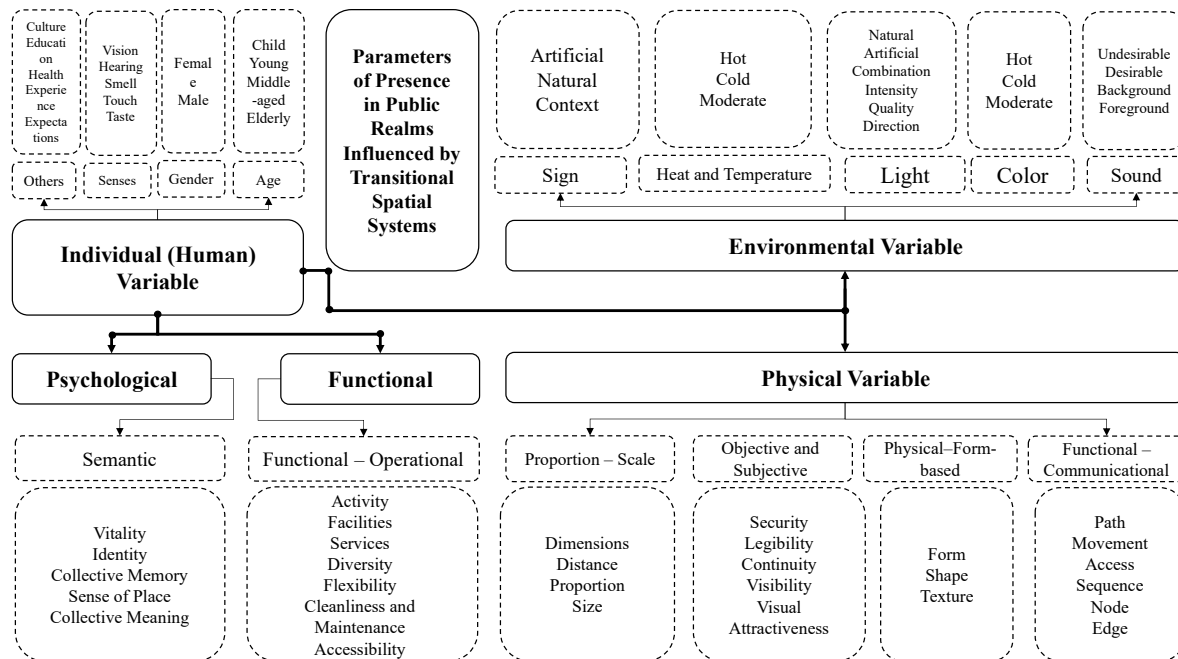


Figure 2. Parameters influencing presence in public spaces.

Source: Author, adapted from Anderson et al. (2024); Poulsen (2023); Riccardi (2023); Greenwich (2022); Carmona (2021), and other sources in the theoretical framework of the study.

3. Research Methodology

This study adopts a **mixed-method approach** (quantitative–qualitative) to simultaneously incorporate users' perceptual data and structural spatial analysis for assessing place presence. This integrated framework enables a multi-layered investigation of the physical and social components of the Isfahan Traditional Bazaar.

Statistical Population and Sample Size

The statistical population of this research comprises users of the Qeysarieh district of Isfahan Bazaar, including tourists, shopkeepers, and visitors. Based on surveillance camera counts during peak periods, the total population of the entire traditional bazaar is estimated at approximately 12,000 individuals. Considering the specific spatial and functional characteristics of Qeysarieh, including:

1. Its bottleneck position and direct connection to Naqsh-e Jahan Square through the Qeysarieh Gate/Forecourt,
2. Concentration of tourism–service functions around the forecourt and along the main bazaars,
3. High pedestrian flow during peak hours, and
4. Preliminary space syntax results indicating higher integration and choice values along the Qeysarieh axis compared to surrounding sections,

the demand share of this district is estimated at roughly one-third of the entire bazaar. Therefore, the base population for Qeysarieh was considered $\approx 4,000$ people, and the required sample size was calculated as ≈ 351 individuals. Sampling was conducted purposefully at locations with the highest interaction with interface spatial systems (Qeysarieh Forecourt, main chaharsu intersections, entrances to caravanserais/timchehs, and high-traffic bazaars) during both peak and off-peak hours to minimize temporal bias.

Data Collection Tools and Reliability

The research questionnaire includes items across four main dimensions—environmental, physical, functional, and psychological—developed based on the theoretical literature and extracted indicators. To assess reliability, a pilot test was conducted with 30 participants from the target population. Results analyzed using SPSS v26 showed an overall Cronbach's alpha of 0.82, indicating high reliability of the measurement instrument.

Quantitative Component: Assessing Users' Perceptions

Quantitative data were analyzed using SPSS v26. First, the Kolmogorov–Smirnov test was applied to assess normality. A one-sample t-test (5-point Likert scale) measured perceived presence factors, and the Friedman test was used to prioritize components and rank indicators within the four dimensions of presence.

With $n = 351$ and notable effect sizes ($t \approx 7.50, 5.10, 3.80$ in significant dimensions), post hoc power analysis indicated values > 0.80 . Alongside $\alpha = 0.05$ and data normality (K–S: $p > 0.05$), statistical adequacy and the generalizability of results to the Qeysarieh target population were confirmed.

Qualitative Component: Spatial Structure Analysis and Conceptual Framework Development

1. **Literature review and theoretical framework development**, and
2. **Structural analysis of interface spatial systems** using space syntax theory.

In the first pathway, a document-based review and content analysis of reputable academic sources were conducted to extract theoretical foundations of presence and interface spatial systems. Findings were organized into a combined conceptual diagram defining key presence indicators in the four dimensions (environmental, physical, functional, psychological) in relation to spatial structure types. All research questions, fieldwork components, and spatial analysis indicators were directly derived from this theoretical framework.

Subsequently, space syntax was applied to analyze the spatial structure of Qeysarieh. The primary objective was to evaluate how spatial configuration enhances or undermines presence in the bazaar's interface spaces. The analysis was structured into four main levels:

- 1- Analysis of the overall movement network.
- 2- Analysis of legibility and visual perception.
- 3- Simulation of pedestrian movement behavior.
- 4- Comparative analysis of spatial indicators.

The overall structure of the research stages and the data analysis process is illustrated in Figure 3.

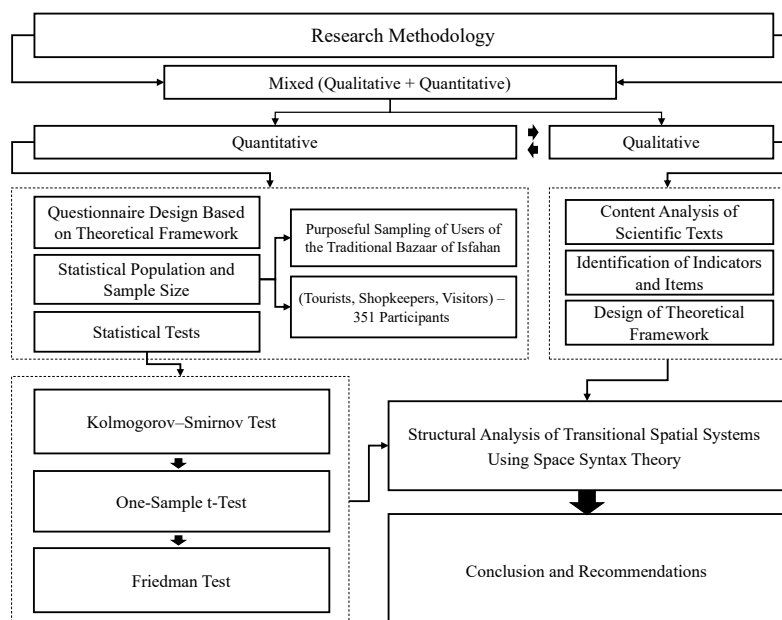


Figure 3. Research methodology structure (mixed qualitative–quantitative approach), Source: Author

Study Area

The spatial scope of this research is the Qeysarieh precinct of the Isfahan Bazaar—a strategic gateway that connects Naqsh-e Jahan Square to the continuous network of the historic bazaar through the Qeysarieh portal and forecourt. This area was selected due to its high pedestrian flow density, the coexistence of tourism–service–economic land uses, and the diversity of in-between spatial elements, including main raastehs (linear bazaar pathways), forecourts, chahar-suqs (major crossroads), caravanserai entrances, and connective passageways (Figure 4).

The southern boundary extends to the threshold of the forecourt entrance, the northern boundary to the first transitional node of the bazaar, and the eastern and western boundaries to the functional depth of façades and their adjoining pre-spaces. The precinct encompasses the main Qeysarieh raasteh, central chahar-suqs, entrances and pre-spaces of caravanserais, and subsidiary connective alleys, while excluding the Naqsh-e Jahan Square surface, areas beyond the transitional node, and private spaces. The scale of analysis in this study is micro–meso, with field surveys conducted during both peak and off-peak hours to minimize temporal bias (Table 1-3).

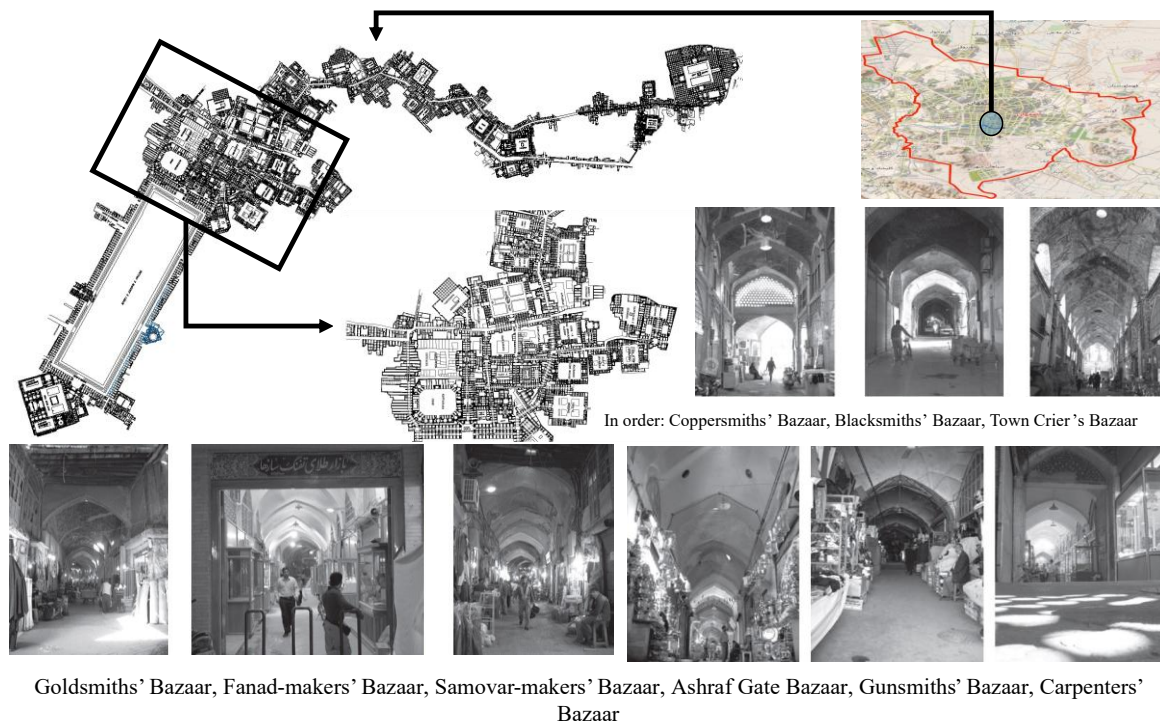


Figure 4. Study area boundary

Figure 1. Main and secondary raastehs and the forecourt in the Qeysarieh precinct

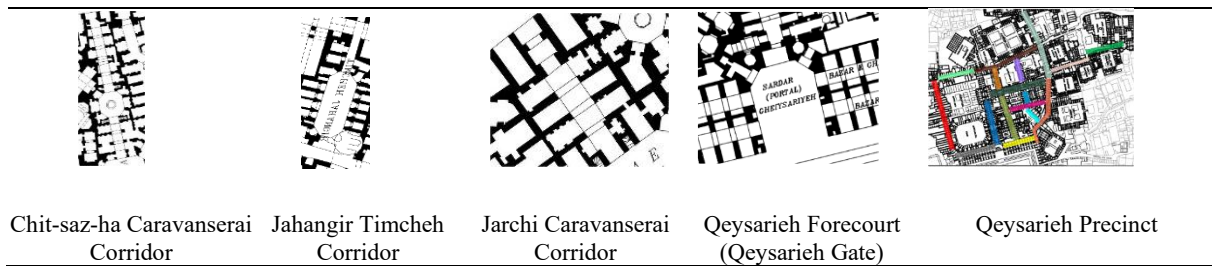


Figure 2. Chahar-sou of the Qeysarieh precinct in Isfahan Bazaar

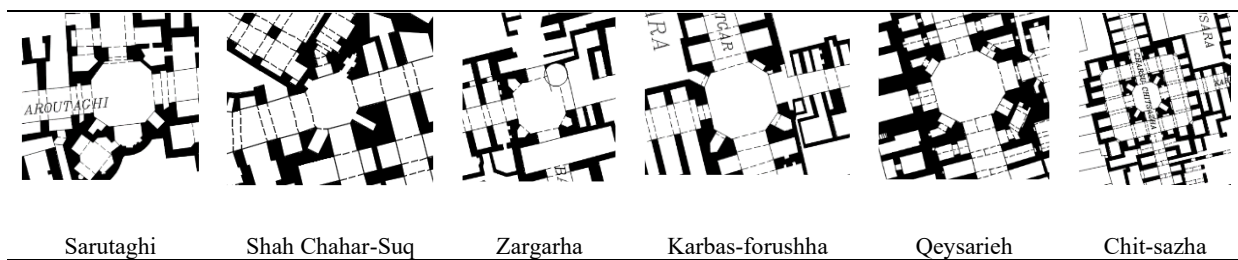
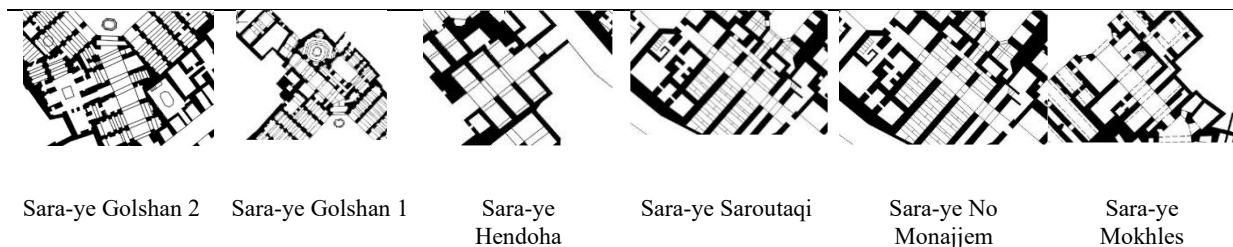


Figure 3. Dalans of the Qeysarieh precinct in Isfahan Bazaar



4- Testing the Main Variables Based on Questionnaire Data

Kolmogorov–Smirnov Test for Normality of the Main Variables

In this study, the Kolmogorov–Smirnov test was used to examine the normality of the collected data distribution (Table 4).

Table 4. Results of the Kolmogorov–Smirnov test for assessing the normality of the distribution of the main variables

| Main Variable | K–S Statistic | p-value | Significance Level |
|---------------|---------------|---------|--------------------|
| Environmental | 0.075 | 0.921 | Not significant |
| Physical | 0.100 | 0.786 | Not significant |
| Functional | 0.081 | 0.713 | Not significant |
| Psychological | 0.106 | 0.593 | Not significant |

The results indicate that the environmental, physical, functional, and psychological variables follow a normal distribution.

One-Sample t-Test

Based on Table 5, the overall level of presence in the Qeysarieh precinct of Isfahan Bazaar was evaluated as above average, with the greatest improvement observed in the functional dimension ($t = 7.50$) and the least in the physical dimension ($t = 2.00$).

Table 5. Results of the one-sample t-test

| Variable | Mean | t | p | Difference from 3 | Result |
|---------------|------|------|-------|-------------------|-----------------|
| Psychological | 3.70 | 7.50 | 0.000 | 0.70 | Significant |
| Functional | 3.55 | 5.10 | 0.001 | 0.55 | Significant |
| Environmental | 3.40 | 3.80 | 0.020 | 0.40 | Significant |
| Physical | 3.20 | 2.00 | 0.130 | 0.20 | Not significant |

According to Table 5 the functional, environmental, and psychological dimensions are significantly higher than the baseline value, whereas the physical dimension shows no significant difference. This pattern directs the priority of interventions toward strengthening functions and environmental conditions, along with enhancing spatial perception, while underscoring the need for targeted revisions in physical interventions aligned with the historic fabric.

Friedman Test Analysis

To rank the intra-dimensional components of each variable in the Qeysarieh precinct, the non-parametric Friedman test (k related samples) was applied, as it is suitable for comparing multiple correlated components on ordinal scales. The mean ranks are presented in Table 6.

Table 6. Friedman test results for ranking variable components in the Qeysarieh precinct of Isfahan Bazaar

| Variable | Component | Mean Rank | Variable | Component | Mean Rank |
|---------------|-------------------------|-----------|---------------|---------------|-----------|
| Environmental | Landmarks | 4.55 | Functional | Activity | 4.85 |
| | Lighting | 4.35 | | Accessibility | 4.75 |
| | Color | 4.20 | | Amenities | 4.60 |
| | Sound | 3.95 | | Services | 4.40 |
| | Temperature & Climate | 3.75 | | Diversity | 4.25 |
| Physical | Functional–Connectivity | 4.25 | Psychological | Cleanliness | 4.05 |
| | Tangible & Intangible | 4.00 | | Flexibility | 3.85 |
| | Proportion–Scale | 3.85 | | Liveliness | 4.50 |

| Variable | Component | Mean Rank | Variable | Component | Mean Rank |
|----------|---------------|-----------|----------|--------------------|-----------|
| | Physical–Form | 3.75 | | Identity | 4.40 |
| | | | | Sense of Place | 4.30 |
| | | | | Collective Memory | 4.10 |
| | | | | Collective Meaning | 3.95 |

Table 7. Friedman test statistics for the main variables in the Qeysarieh precinct of Isfahan Bazaar

| Variable | N | Chi-Square | df | Asymp. Sig. |
|---------------|-----|------------|----|-------------|
| Psychological | 351 | 41.20 | 4 | < 0.001 |
| Functional | 351 | 36.50 | 3 | < 0.001 |
| Environmental | 351 | 45.80 | 6 | < 0.001 |
| Physical | 351 | 40.30 | 4 | < 0.001 |

According to Table 5, the null hypothesis of equal ranks was rejected for all four dimensions ($p < 0.001$). Based on Table 6, in the functional dimension, Activity and Accessibility ranked highest; in the environmental dimension, Landmarks and Lighting; in the psychological dimension, Liveliness and Identity; and in the physical dimension, Functional–Connectivity ranked highest. Therefore, improvement priorities in the Qeysarieh precinct should focus on these components.

Section 2: Spatial Structure and Space Syntax Analysis

In this section, the spatial structure of the Qeysarieh precinct of Isfahan Bazaar is analyzed using Space Syntax Theory to evaluate the relationship between the spatial configuration of intermediate spatial systems and presence indicators. The results of each stage are presented separately in the form of analytical tables and diagrams to allow for precise comparison and assessment of the impact of spatial structure on presence quality.

Stage 1: Analysis of the Overall Movement Network Structure

At this stage, the overall structure of the bazaar’s movement network is examined with the aim of identifying the degree of Accessibility, Centrality, and the main movement routes. Spatial configuration indicators used include Integration (both Local Integration and Global Integration), Choice, and Mean Depth, in order to assess Spatial Connectivity and the Position of Intermediate Spatial Systems.

Figure 5 illustrates the process of analysis and the application of each index (Index Applications), while Table 8 introduces the indicators used in this stage.

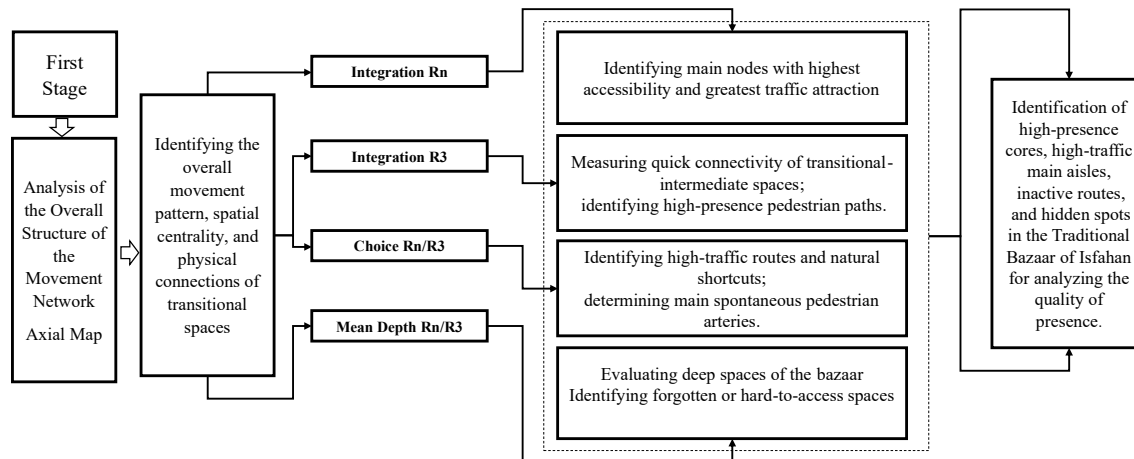


Figure 5. Process of analyzing the overall movement network structure of the bazaar and the main Space Syntax indicators

Table 8. Analytical indicators used in analyzing the overall spatial network structure of the Traditional Bazaar of Isfahan

| Axial Map | | | | | |
|-------------|----------------|------------|---------------|-----------|-----------|
| Integration | Integration R3 | Mean Depth | Mean Depth R3 | Choice rn | Choice R3 |
| | | | | | |

Phase Two: Analysis of Legibility and Visual Perception

In this phase, the spatial legibility and visual perception of the Qeysarieh Bazaar area in Isfahan are examined using Visibility Graph Analysis (VGA). The purpose of this analysis is to assess the visual quality of intermediate spatial systems and evaluate the degree of spatial transparency within the Qeysarieh Bazaar's spatial structure.

For this purpose, the bazaar space was converted into a network of visibility points, and four key indicators were employed to examine the visual field, visual connectivity, and spatial integration of the intermediate spaces.

Figure 6 illustrates the analysis process and the visual output, while Table 9 presents the VGA analytical indicators and their applications.

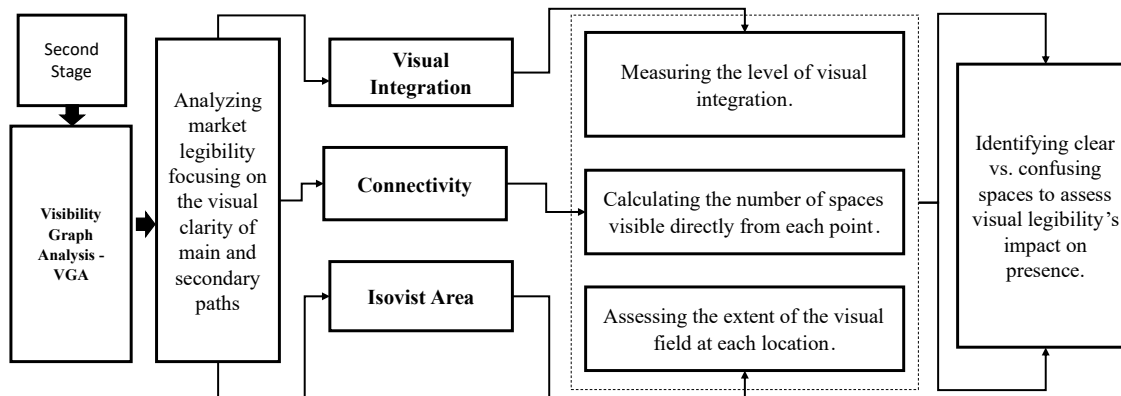


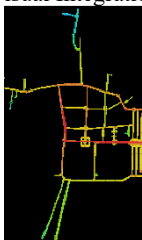




Figure 6. Process of Analyzing Legibility and Visual Perception of the Traditional Bazaar of Isfahan Using Visibility Graph Analysis (VGA)

Table 9. Analytical Indices Used in the Visibility Graph Analysis (VGA) of the Traditional Bazaar of Isfahan

| Visibility Graph Analysis (VGA) | | | | |
|--|--|--|--|--|
| Point First Moment | Point Second Moment | Visual Integration | VGA Connectivity | Isovist Area (m ²) |
|  |  |  |  |  |

Step 3: Analysis of User Movement and Behaviour

In this stage, the user movement behaviour within the Qeysarieh precinct of the Isfahan Bazaar is analysed using Agent-Based Simulation. The aim of this analysis is to identify high-traffic routes, evaluate spontaneous movement patterns, and assess the spatial attraction of intermediate spatial systems.

For this purpose, the Random Walkers Model was implemented to represent user movements without a predetermined destination, and the outputs are presented as heatmaps. Figure 7 illustrates the analysis process and the resulting movement density maps, while Table 9 introduces the movement model and the applied indices.

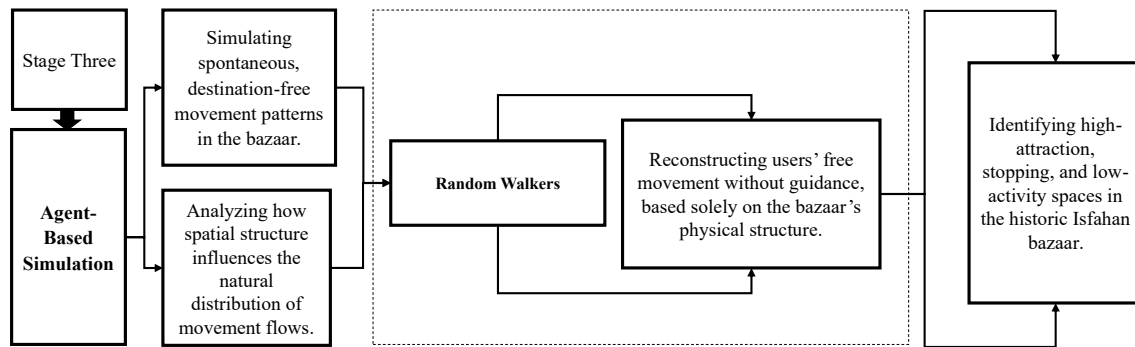



Figure 7. Process of simulating user movement behaviour using the Random Walkers model and the movement density maps of the Isfahan Traditional Bazaar.

Table 9. Indicators and characteristics of the Agent-Based Simulation model in analysing movement behaviour in the Isfahan Traditional Bazaar.

| Agent-based Simulation |
|--|
| Random walkers |
|  |

Step Four: Comparative Analysis of Indicators

In this stage, the overall spatial intelligibility of the Qeysarieh district in the Isfahan Bazaar is examined through a comparative analysis of spatial integration and local connectivity indices. The objective of this analysis is to evaluate the relationship between the overall spatial configuration and users' local perception of the market spaces.

First, the linear correlation between the indices is assessed, followed by a regression analysis to calculate the coefficient of determination (R^2). Figure 8 illustrates the analysis process and the correlation graph, while Table 10 presents the statistical results of the spatial intelligibility analysis.

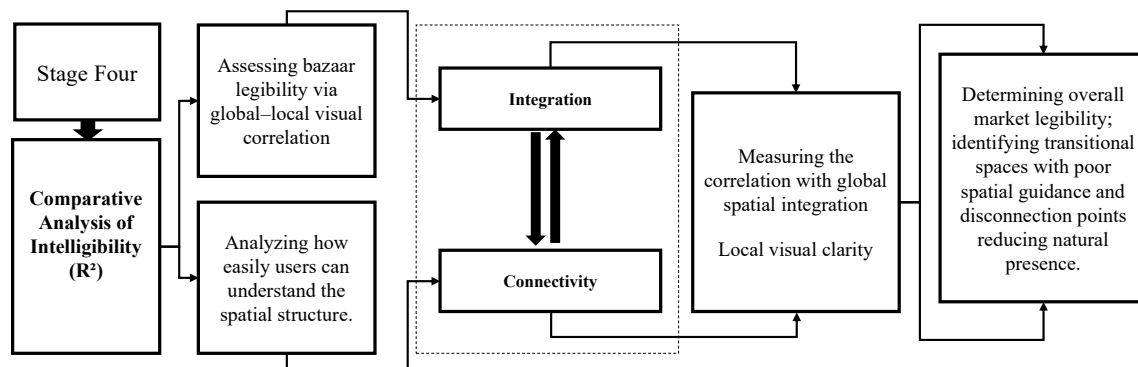


Figure 8. Correlation graph of Intelligibility, Integration, and Connectivity indices in the traditional bazaar of Isfahan.

Table 10. Correlation results and coefficient of determination (R^2) for the spatial intelligibility analysis of the traditional bazaar of Isfahan.

| Intelligibility | |
|-----------------|--------------|
| Intelligibility | Connectivity |
| | Connectivity |

5. Discussion and Conclusion

The findings of this study indicate that the quality of presence in the Qeysarieh precinct is predominantly influenced by psychological, functional, and environmental dimensions, all of which were evaluated as significantly higher than the baseline level in the one-sample t-test. In contrast, the physical dimension did not show a significant difference from the baseline. The Friedman test results further revealed that, within the functional dimension, activity and accessibility ranked highest; within the environmental dimension, landmarks and lighting were most prominent; and within the psychological dimension, vitality and identity held the highest priorities. This pattern suggests that sustainable presence in the precinct emerges when movement flows and pause spaces are aligned with effective wayfinding, appropriate lighting, and programmed activities, while physical interventions are integrated with these components.

The space syntax analysis—utilizing Integration, Choice, Mean Depth, VGA and Isovist analysis, Agent-Based Simulation, and Intelligibility assessment—provided a precise depiction of the spatial structure of Qeysarieh. Results showed that Zarrabkhaneh Raasteh, as the market’s main artery, achieved the highest spatial integration and choice values, serving as the primary hub for social interaction. Qeysarieh Chaharsooq, as the central network node, plays a critical role in movement distribution and visual focal point creation, while Zargarha Bazaar, acting as an intermediate route, connects secondary spaces. The evaluation of Chaharsooqs demonstrated that, in terms of centrality and function, their impact follows the order: Chitsazha > Qeysarieh Chaharsooq > Karbasforooshs > Zargarha > Shah > Sarotaghi, with their influence being notably higher than that of corridors (Dalans) and caravanserais (Saraas). Conversely, secondary bazaars and corridors, due to greater spatial depth and limited visibility, require strengthened wayfinding and enhanced perceptual quality. The low coefficient of determination for Intelligibility ($R^2 = 0.11$) indicated that, while the main routes are legible, the secondary network remains challenging for unfamiliar users without visual guidance or prior experience.

The integration of quantitative and spatial-syntactic findings suggests that enhancing presence in Qeysarieh requires three primary strategies:

1. Enhancing perceptual guidance through hierarchical wayfinding systems, directional lighting, and framed entrances, particularly in forecourts and major junctions.
2. Synchronizing movement and pause in high-centrality corridors by creating small-scale stopping points, diversifying compatible activities, and distributing services in high-interaction nodes.
3. Improving connectivity of low-centrality spaces, such as corridors and secondary bazaars, to the main axis through visual openings, coded entrances, and the placement of attractive uses at thresholds.

By aligning form, function, and perception, these strategies can foster greater legibility, enrich the sense of place, and ensure the sustainable presence of this historic precinct. These strategies and guidelines are presented in Table 11. Furthermore, to enhance comprehension and provide a clearer visualization of the findings, the radar charts, heatmap, and bar chart have been utilized (Figures 9, 10, and 11).

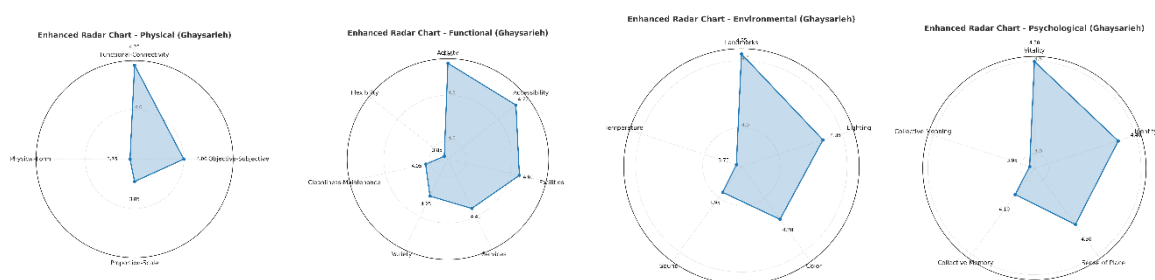


Figure 9. Comparative Radar Charts of Mean Ranks for Environmental, Functional, Physical, and Psychological Dimensions in the Qeysarieh Precinct (Friedman Test Results)

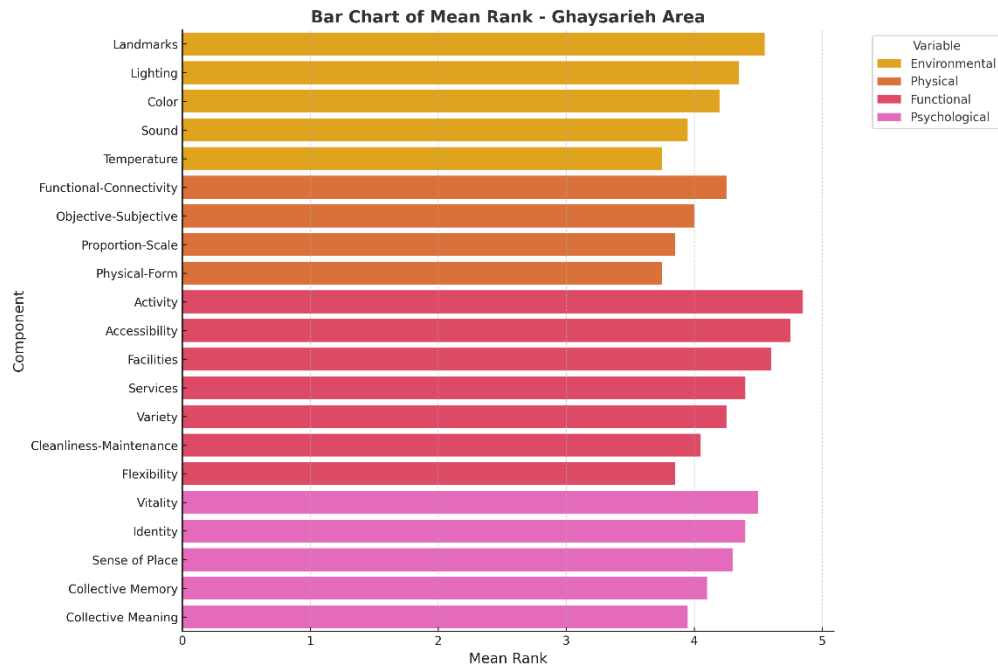


Figure10. Bar Chart of Mean Ranks for Environmental, Functional, Physical, and Psychological Components in the Qeysarieh Precinct (Friedman Test Results)

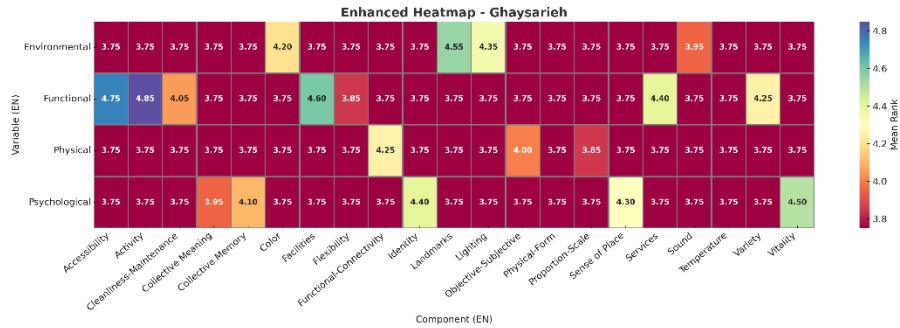


Figure 11. Enhanced Heatmap of Mean Ranks for Environmental, Functional, Physical, and Psychological Components in the Qeysarieh Precinct (Friedman Test Results)

Table 11. Strategies, Operational Measures, and References for Enhancing Place Presence in the Qeysarieh District of Isfahan Bazaar

| Spatial Element | | Main Strategy | Operational Measures | References |
|--------------------------------|------|--|--|-----------------------------------|
| Qeysarieh Gate Forecourt | | Enhancing threshold function and initial user guidance | Multilingual hierarchical signage, directional lighting, framed entrances, crowd and queue management during peak hours | Carmona (2021); Lee & Choi (2022) |
| Zarrabkhaneh (Qeysarieh Spine) | Axis | Maintaining and strengthening the backbone movement function | Continuous linear lighting, coordinated signage and façades, small-scale resting points, preservation of effective passage width | Hillier (2007); Gao & Liu (2023) |

| | | | |
|--|--|--|--|
| Chaharsoughs (Chitsazha, Qeysarieh, Karbasforushha, Zargarha, Shah, Sarutaghi) | Strengthening joint role and enhancing pause quality | Clear sightlines, shaded seating for pauses, accent lighting, placement of activities aligned with historical identity | Oldenburg (1999); González & Balsas (2023) |
| Zargarha Bazaar | Improving intermediary role between main axis and subsidiary markets | Legible cross-connections to Chaharsoughs, unified signage, improved shop window quality | Poulsen (2023); Silva & Costa (2022) |
| Parallel Bazaars (Samavarsazha, Zaribafat) | Increasing interaction and dwell time in parallel paths | Visual openings to main axis, color-coded wayfinding, compatible land-use diversity | Zhao et al. (2023); Riccardi & Ventura (2024) |
| Subsidiary Bazaars (Chakhmaqsazha, Assari) | Enhancing legibility and attracting pauses | Prominent entrance signage, accent lighting, hosting attractive activities such as handicrafts or live demonstrations | Kim & Kaplan (2023); Qian et al. (2024) |
| Alleys and Caravanserais (Golshan, Makhles, etc.) | Increasing visual and functional linkage with main axis | Framed entrances, color/number coding, continuous guiding light, removal of visual obstructions | Gehl (1987); Salama & Wiedmann (2020) |
| Darvazeh Ashraf and Golshan Bazaars | Strengthening connective role with surrounding fabric | Landmark gateway design, coordinated signage with main axis, creating direct paths to target nodes | Anderson et al. (2024); Marquet & Miralles-Guasch (2023) |

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This research examines the role of in-between spatial systems in enhancing presence quality, taking the Qeysarieh precinct of the Isfahan Bazaar—one of the principal connectors between Naqsh-e Jahan Square and the historic bazaar network—as the study area. The precinct was selected owing to its high density of pedestrian flows, adjacency to tourism–service–commercial land uses, and diversity of intermediary spatial elements. The study adopted a mixed-methods (quantitative–qualitative) approach. In the quantitative component, perceptual data from 351 users regarding four dimensions—environmental, physical, functional, and psychological—were collected through a standardized questionnaire and analyzed using the one-sample t-test and Friedman test. In the qualitative component, the spatial structure was evaluated through a space-syntax approach at four levels: axial analysis (Integration, Choice, Mean Depth), visibility analysis (VGA) and isovists, agent-based simulation, and assessment of overall intelligibility. Quantitative results indicated that psychological, functional, and environmental dimensions were assessed above baseline, whereas the physical variable showed no significant difference. Syntactic analysis showed that the Zarrabkhaneh route and Qeysarieh Chahar-Suq exhibited the highest centrality and distributive roles, and that chahar-suqs exerted greater influence on movement and stopping than corridors. The low coefficient of determination for intelligibility ($R^2 = 0.11$) indicates a need to improve perceptual guidance within secondary networks. Integrating the quantitative and qualitative findings suggests three principal strategies whose implementation, by aligning form, function, and perception, can increase the sustainability of presence quality and enhance user experience within historic urban fabrics.