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Assessing the Impact of Spatial Intermediary Systems on Presence Indicators in Public Spaces; Case Study: Traditional Bazaar of Isfahan*

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ABSTRACT

Spatial intermediary systems serve as elements connecting public and private spaces. Although they play a crucial role in facilitating movement, enhancing spatial integration, and promoting social interactions, their impact on the presence of public spaces has received relatively less attention. This study aims to analyze and prioritize the factors affecting the presence of spatial intermediary systems in the traditional bazaar of Isfahan. The research employs a mixed-method approach. In the qualitative phase, key components of presence, namely environmental, physical, functional, and psychological dimensions, were identified through a content analysis of theoretical texts. In the quantitative phase, these components were evaluated using a Likert-scale questionnaire administered to users of Isfahan's traditional bazaar (n = 372). The collected data were analyzed using a one-sample t-test, analysis of variance (ANOVA), confirmatory factor analysis (CFA), and a Friedman test. The results revealed that spatial intermediary systems influence the presence of public spaces differently, depending on their functional, physical, and psychological characteristics. In the tourist area (Shah Square and Bazaar), psychological factors (including sense of place, vibrancy, and identity) had the most significant impact (factor loading = 0.83, ranked first in the Friedman test). In the tourist-service area (Qaysariyah), the functional factors (including economic activities, accessibility, and amenities) were identified as the most important (factor loading = 0.79, ranked second in the Friedman test). In the service-local area (from Dar-e-Bagh Rasteh to Nezamiyah and Kohne Square), both functional and environmental factors were found to influence the presence significantly. ANOVA analysis indicated a significant difference among various areas in psychological variables (P = 0.02), while other variables remained statistically insignificant. The findings suggest several strategies to enhance the presence of spatial intermediary systems: improving perceptual quality and spatial identity in historical areas, and upgrading functional infrastructure in service-economic areas. The results of this research offer invaluable insights for optimizing public space designs and enhancing presence in traditional bazaars and other urban public spaces.

Keywords: Spatial Intermediary Systems, Presence, Public Spaces, Isfahan's Traditional Bazaar.

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1. INTRODUCTION

The presence of individuals in urban spaces reflects the environment's ability to attract and maintain human interactions, facilitate social activities, and promote a sense of belonging and vibrancy in the space (Qi, Mazumdar, and Vasconcelos 2024; Kamani Fard and Paydar 2024). Spatial intermediary systems, which are spaces situated between public and private areas, play a crucial role in enhancing presence by facilitating spatial connections and fostering meaningful social interactions (Lin and Chang 2025; Gao and Liu 2023).

These systems can include transitional spaces, connecting routes, in-between areas, interactive spaces, etc. (Mirshahzadeh et al. 2011). They can be defined physically (such as rastehs, corridors, chahar suq, entrances, etc.) (Noghrekar et al. 1999; Balilan Asl and Satarzadeh 2015) or perceptually (such as mental boundaries between public and semi-public spaces) (Jackson and Brown 2023; Turner and Harris 2023).

Among various areas, Iranian traditional bazaars, as a notable example of historical public spaces in Iran, known for their unique physical structure, dense spatial sequence, and complex network of passages and intermediary spaces, provide a scientific and reliable ground for examining the influence of spatial intermediary spaces on presence (Jalali et al. 2021). Specifically, the traditional bazaar of Isfahan serves as an ideal setting for analyzing the role of these systems in enhancing presence, owing to its unique spatial structure, including endogenous spatial order, complex physical continuity, and overlapping historical layers (Pahlevan and Habib 2023). This bazaar is recognized as one of the leading examples of Iranian bazaars within the historical urban system (Pahlevan, Salianzadeh, and Habib 2022) and has significant potential for exploring socio-spatial interactions due to the integration of diverse commercial, cultural, religious, and service functions within a continuous spatial network (Soltanzadeh 2024). Additionally, the high level of contemporary interventions, the diversity of active and passive spatial areas, and the continuity of its economic function compared to other similar bazaars (Shafighi 2015) create an opportunity for an objectively comparative study of the effectiveness of spatial intermediary systems in promoting presence.

Factors such as weakened spatial legibility due to inappropriate physical interventions (Chen and Roberts 2024), reduced environmental comfort caused by overcrowding and inaddequate infrastructure (Smith and Johnson 2023), and diminished spatial identity and sense of belonging due to the prevalence of commercial activities unrelated to the historical identity (Jackson and Brown 2023) have contributed to a significant decline in the quality and desirability of these spaces. This situation underscores the need for a thorough review of intermediary space design and management strategies. Therefore, the primary aim of this study is to analyze the impact of intermediary systems on key indicators of presence in Isfahan's traditional bazaar. The research seeks to answer the following questions:

What are the most important components and elements influencing presence in public areas?

How can one identify and prioritize the variables and components affecting presence in the spatial intermediary systems of Isfahan's traditional bazaar?

The present research is organized into four main stages: "Explanation", "Evaluation", "Revision", and "Formulation". By focusing on the theoretical foundations and research backgrounds, analyzing field data, providing practical solutions, and formulating a final report, each stage offers a coherent and purposeful structure to achieve the research outcomes. The research framework encompasses both theoretical (what and how) and practical (implementation method) dimensions, guiding the research process from problem identification to the presentation of final solutions and conclusions. Figure 1 outlines the conceptual research model.

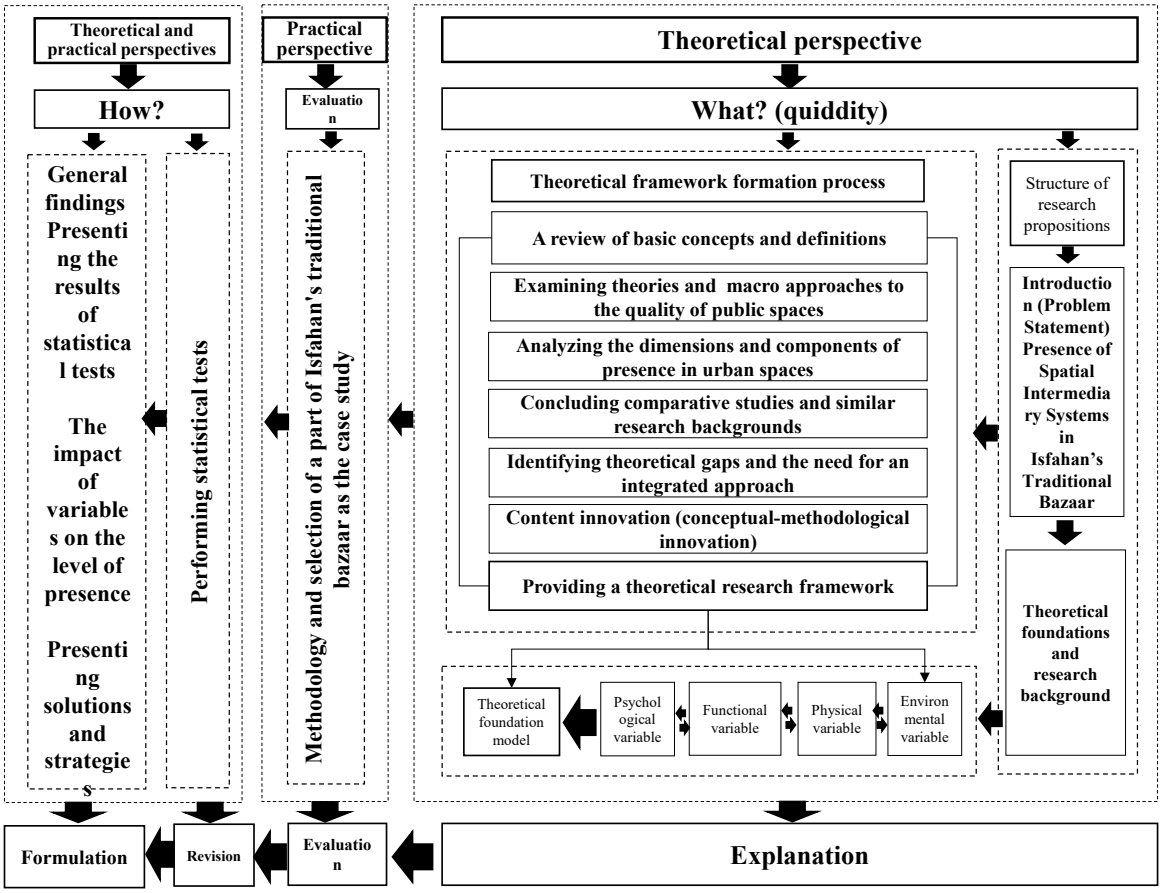

Fig. 1. Conceptual Research Model

2. THEORETICAL FOUNDATIONS AND RESEARCH BACKGROUND

In architecture, urban design, and environmental psychology, the concept of presence refers to the quality of active, perceived, and meaningful human presence in public spaces (Anderson et al. 2024). This concept goes beyond mere physical presence or the number of people in space; it encompasses perceptual, psychological, functional, and social dimensions (Samavati 2022; Barranco Merino et al. 2023). Recently, presence has been widely recognized as a multidimensional criterion and is considered one of the key indicators for assessing the quality of urban environments (John et al. 2025). In the following sections, various perspectives are reviewed to analyze the theoretical dimensions relevant to presence to provide the conceptual context required for a comprehensive framework of the concept of presence.

Researchers such as Poulsen (2023), Greenwich (2022), and Brown (2022) assert that presence occurs when urban environments facilitate spontaneous interactions, voluntary pauses, and flexible use of spaces. They emphasize the significance of spaces that provide a variety of activities and effectively meet the daily needs of people through services, amenities, and adequate access (Hidalgo and Hernández 2022; Zhao et al. 2023). Additionally, the adaptability of environments to diverse behavioral patterns, spatial flexibility, and infrastructure that supports human interactions are key features that encourage users to linger in a space (Silva and Costa 2022; Smith and Johnson 2024). In essence, stable presence develops when the physical-functional context of a space aligns with the needs and lifestyles of its users (Marquet and Mihalles-Guasch 2023).

Conversely, scholars such as Kowler (2022) and Hoffmann (2023) underscore the importance of psychological, perceptual, and semantic dimensions of presence. This approach views space not merely as a physical ground but also as an experienced place imbued with meaning and collective memory, which fosters sustained presence through a sense of place, spatial identity, and emotional bonds (Lewicka and Manzo 2022). Elements such as physical and visual signs, the understanding of spatial codes, and the generation of a sense of belonging contribute to mental security, relaxation, and vibrancy within a space, thereby promoting active presence (Kim and Kaplan 2023; Qian et al. 2024). This perceptual

relationship is particularly crucial in historical public spaces, where semantic and cultural significances play a vital role in preserving the quality of presence (Carmona 2021; Riccardi and Ventura 2024).

In this regard, theorists such as Oldenburg (1999), Jacobs (1961), and Habermas (1962) have also emphasized the importance of coordinating the body and activity in public spaces (Can and Heath 2024). They argue that spaces characterized by high-quality presence encompass not only coherent structures but also perceived paths, appropriate levels of vision, human-scale design, and opportunities for collective activities (Sharifi and Muyama 2021; Rojas and Páez 2022).

Among various types of spaces, the role of spatial intermediary systems (such as crossings, chahar suqs, entrances, iwans, etc.) as transitional and connecting nodes (Gehl 1987; Salama and Wiedmann 2020) has often been overlooked. These systems serve as connecting points that promote space perception (Lee and Choi 2022; Rapoport 2007), facilitate movements, and create opportunities for pausing and interaction (Oldenburg 1999; Carmona 2021). However, recent studies indicate that these systems effectively bridge private and public spaces, enhancing legibility, belonging, and relaxation for users (Lee and Choi 2022; González and Balsas 2023).

Some new approaches have modified these theories. The sole focus on spatial order and physical structure, without regard for user behavioral patterns and flexible needs, can result in the creation of inefficient, soulless, and unwelcoming spaces (Riccardi and Ventura 2022; Zhao et al. 2023). Designs that fail to consider functional diversity, actual pathways, and users' perceptual preferences often do not foster a sense of invitation and voluntary participation (Huang et al. 2021; Park and Kim 2024). This is particularly evident in historic spaces whose structures have been negatively impacted by inappropriate interventions or formalist redesigns. Thus, it is essential to acknowledge the physical-functional capacities and limitations, while re-evaluating linear and static design models to develop a comprehensive approach to the concept of presence.

Consequently, no previous approach appears to fully capture the concept of presence in complex urban contexts, particularly in historic public spaces. A critical review of past studies reveals that most have analyzed the environmental, physical, functional, and psychological dimensions separately or have overlooked the interrelationship among these dimensions. In spaces such as historic bazaars, presence results from a complex and synergistic interaction of these various aspects. This theoretical gap, especially regarding spatial intermediary systems, highlights the necessity for an integrated approach and renewed conceptual thinking. In this context, the present study focuses on the spatial intermediary systems within Isfahan's traditional bazaar. It aims to simultaneously analyze the components affecting presence using an integrated, structured, and multi-layered approach. The content innovation of this study lies in providing a coherent framework that enables the analysis of relationships between intermediary systems and the four dimensions of presence in an integrated manner, based on current theoretical and empirical literature. This framework leverages the strengths of classical perspectives, while addressing their limitations, thereby providing a scientific basis for the design of historical spaces. As illustrated in Fig.2, this integrated conceptual framework offers a rigorous and comprehensive basis for analyzing and prioritizing the components of presence, allowing for a more precise and practical explanation of the role of spatial intermediary systems in enhancing presence in public spaces.

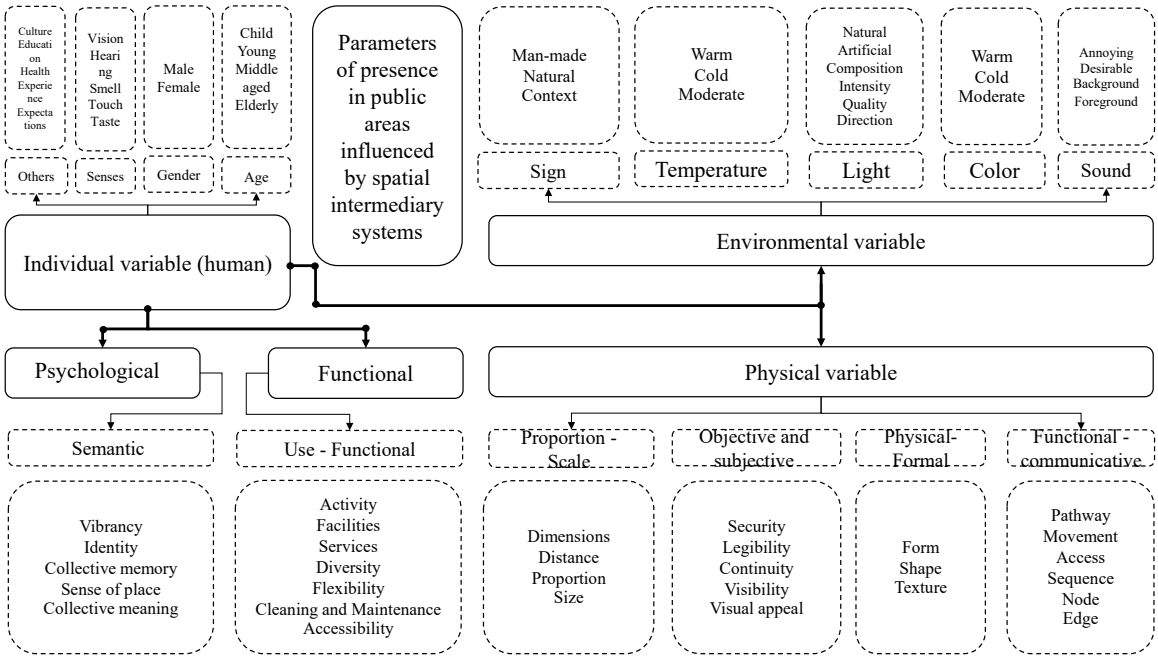

Fig. 2. Parameters Affecting Presence in Public Spaces; derived from Anderson et al. (2024), Poulsen (2023), Riccardi (2023), Greenwich (2022), Carmona (2021), and other References in Theoretical Foundations

3. METHODOLOGY

This research utilizes a mixed-method approach that includes both qualitative and quantitative analyses. In the qualitative phase, key components of presence in spatial systems were extracted through library studies and content analysis of scientific sources. The quantitative phase involved evaluating these components using a five-point Likert scale questionnaire in a case study.

3.1. Statistical Population and Sample Size

The statistical population comprised users of Isfahan's traditional bazaar, including tourists, shopkeepers, and customers. The estimated population size is about 12,000 people, based on data recorded by surveillance cameras during busy days at the bazaar. The sample size was estimated at 372 individuals according to the Cochran formula. The samples were selected using a purposeful sampling technique that prioritized those with the highest level of interaction with the bazaar's public spaces.

3.2. Data Collection Tool and Reliability

The research questionnaire included items across four main dimensions: environmental, physical, functional, and psychological. These dimensions were developed based on theoretical literature and extracted indicators. A pre-test was conducted on a sample of 30 individuals from the target population to assess the reliability of the questionnaire. Results were analyzed using SPSS 26 software, yielding an average Cronbach's alpha index of 0.82, indicating a high level of reliability for the measurement tool.

3.3. Data Analysis Method and Statistical Adequacy

Data analysis was performed using SPSS 26 and AMOS 24 software. The Kolmogorov-Smirnov test assessed the normality of the data. Next, a confirmatory factor analysis (CFA), a one-sample t-test, and a Friedman test were conducted to prioritize the components. Additionally, analysis of variance (ANOVA) was used in certain sections to examine differences between groups. Considering the sample size, the significance level was set at 0.05, and most analyses achieved a medium effect size above 0.80, indicating sufficient statistical power to reveal significant relationships and validate the results. This demonstrates the robustness of the research methodology, including the validity of the research tool, adequacy of the sample size, and the variety of analytical methods employed, which enable generalizing the results. Figure 3 illustrates the mixed qualitative-quantitative approach used in the research methodology.

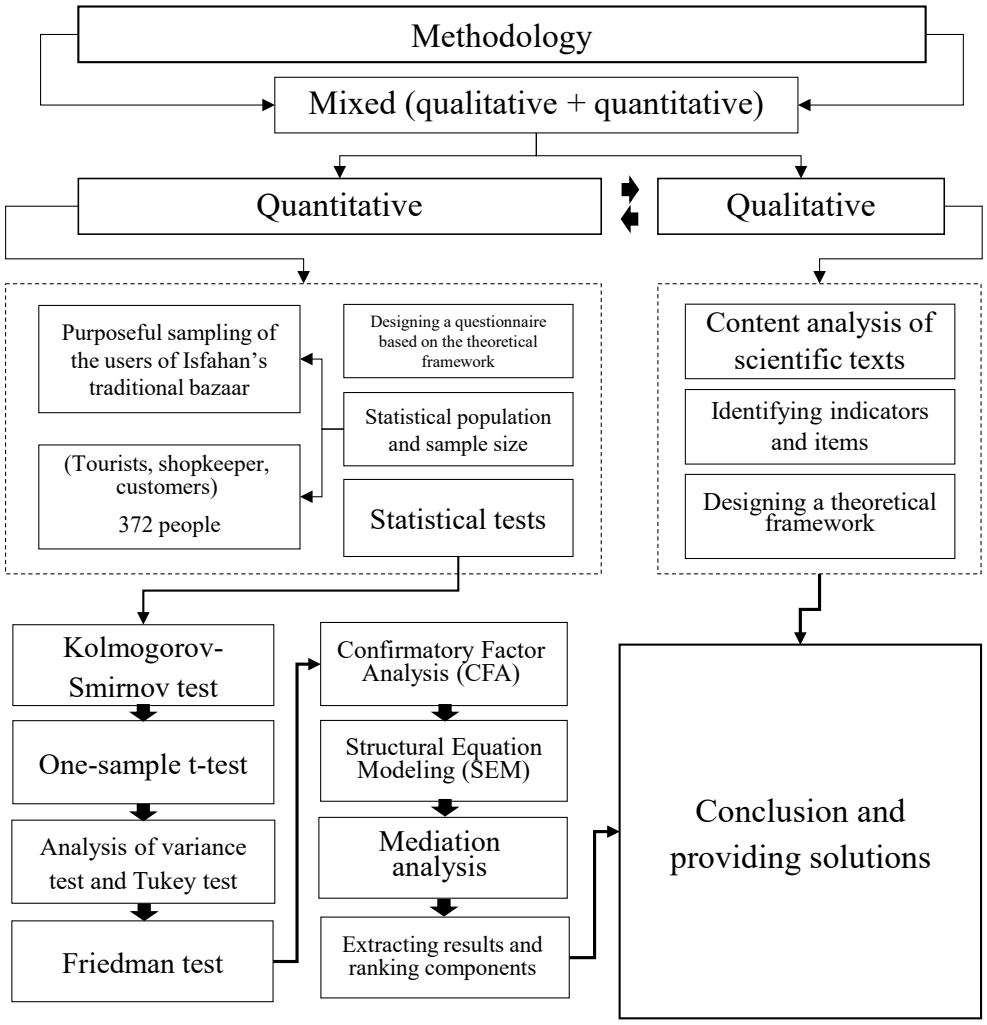

Fig. 3. Research Methodology Structure (Mixed Qualitative-Quantitative Approach) based on the Present Research Process

3.4. Case Study

The case study focused on Isfahan's traditional bazaar, which was divided into three functional areas. This division was necessitated by the uneven distribution of users, the size and complexity of its spatial structure, and historical differences among various sections of the bazaar. It was based on criteria such as type of use, historical characteristics, and spatial distinctions, resulting in three main sections, as depicted in Figure 4.

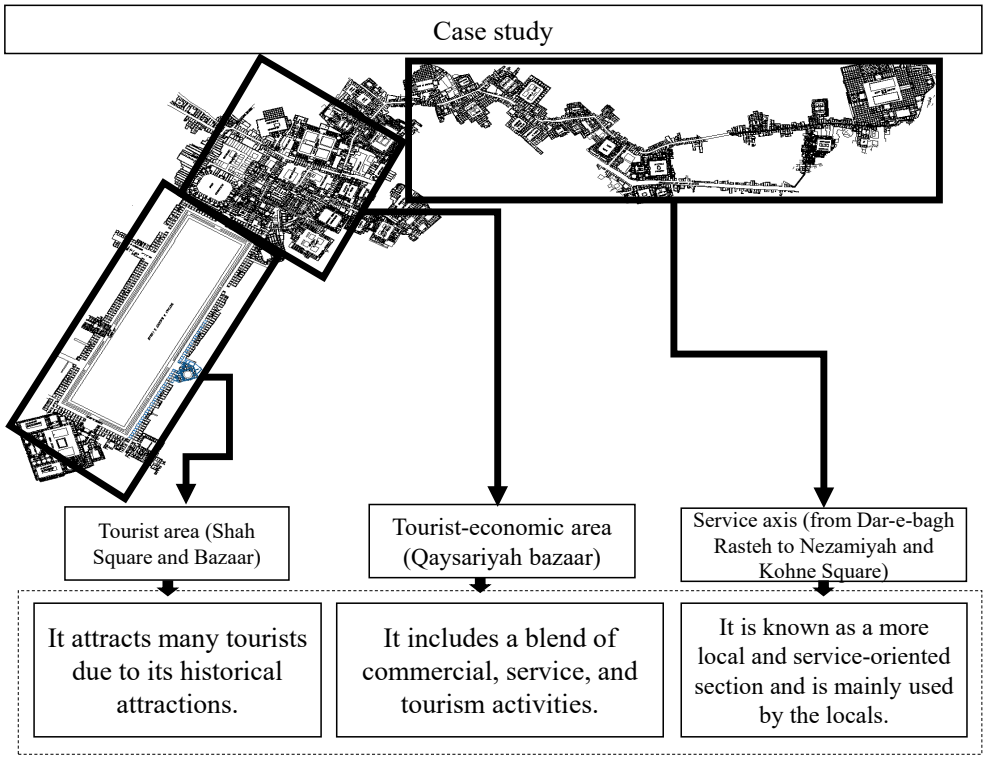

Fig. 4. Case Study

4. TESTING THE MAIN VARIABLES BASED ON THE DATA FROM THE QUESTIONNAIRES

4.1. Kolmogorov-Smirnov Test for Testing the Normality of the Main Variables

Table 1. Results of the Kolmogorov-Smirnov Test for Examining the Normality of the Main Variables

Main Variable	K-S Statistic	P-Value	Sig.
Environmental	0.075	0.921	Insignificant
Physical	0.100	0.786	Insignificant
Functional	0.081	0.713	Insignificant
Psychological	0.106	0.593	Insignificant

The results of this test indicate the normal distribution of environmental, physical, functional, and psychological variables.

4.2. One-Sample t-Test to evaluate the Main Variables in the three Functional Areas of Isfahan's Traditional Bazaar

A one-sample t-test was used to evaluate the significant differences between the means of the four components and the reference value (3). The results are presented in Table 2.

Table 2. Results of the One-Sample t-Test for Evaluating the Research Components in the three Functional Areas of Isfahan's Traditional Bazaar

Area	Variable	Mean	t-Value	p-Value	Interpretation
Tourist Area	Psychological	3.85	9.10	0.000	Significant
	Functional	3.50	4.50	0.002	Significant
	Environmental	3.30	3.20	0.015	Significant
	Physical	3.10	1.80	0.150	Insignificant

Area	Variable	Mean	t-Value	p-Value	Interpretation
Tourist-Service Area	Functional	3.70	7.50	0.000	Significant
	Environmental	3.55	5.10	0.001	Significant
	Psychological	3.40	3.80	0.020	Significant
	Physical	3.20	2.00	0.130	Insignificant
Service Axis	Functional	3.60	6.80	0.000	Significant
	Environmental	3.50	5.00	0.001	Significant
	Physical	3.30	2.90	0.040	Significant
	Psychological	3.10	1.50	0.170	Insignificant

The results reveal that psychological, functional, and environmental variables showed significant averages (above the reference value) in most areas, while the physical variable did not demonstrate a significant difference.

4.3. Analysis of Variance to compare the Variables in the three Functional Areas of the Bazaar

To compare the three functional areas of Isfahan's traditional bazaar concerning the averages of the main research variables, a one-way analysis of variance (ANOVA) test was employed. The test results, outlined in Table 3, revealed a significant difference between the three areas only in the psychological variable ($p = 0.020$). No significant differences were found among the areas for the other variables ($p > 0.05$). To further identify distinct areas in the psychological variable, a Tukey post hoc test was performed (Table 4).

Table 3. Results of the One-Way Analysis of Variance (ANOVA) Test

Variable	Mean (Tourist Area)	Mean (Tourist-Service Area)	Mean (Service Axis)	F-Value	p-Value
Psychological	3.80	3.52	3.48	4.60	0.020
Environmental	3.60	3.55	3.50	1.35	0.260
Physical	3.10	2.98	3.05	2.80	0.060
Functional	3.25	3.22	3.21	0.05	0.990

Table 4. Results of the Tukey Post Hoc Test (Psychological Variable)

Compared Area	Mean Difference	Standard Error	p-Value	Result
Tourist; Service	0.25	0.11	0.04	Significant
Tourist; Service-Economic	0.28	0.12	0.03	Significant
Service; Service-Economic	0.03	0.10	0.84	Insignificant

The results demonstrated that the tourist area differs significantly from the other two areas ($p < 0.05$), while no significant difference was found between the service and service-economic areas. This suggests that psychological components play a key role in enhancing presence in interactive spaces.

4.4. Confirmatory Factor Analysis (CFA) and Structural Equation Model

A first-order confirmatory factor analysis was conducted to evaluate the conformity of the research data with the proposed conceptual model. This analysis aimed to assess the construct validity of the measurement model, confirm the relationships between observed (items) and latent variables, and examine the overall model fit (see Tables 7 to 10).

Table 7. Standardized Factor Weights and Significance of Relationships in the First-Order CFA Model

Latent Variable	Standard Factor Loading	Critical Ratio (CR)	Sig.	Interpretation
Psychological	0.83	9.80	0.000	Confirmed
Functional	0.79	8.85	0.000	Confirmed
Physical	0.75	8.10	0.000	Confirmed
Environmental	0.72	8.25	0.000	Confirmed

As illustrated in Table 7, all research variables have standardized factor loadings above 0.7, indicating strong effects of the measurement indicators on their corresponding latent variables. Also, all composite reliability (CR) values exceed 1.96 with $p < 0.001$, confirming the significance of the relationships in the model. Therefore, the measurement model demonstrates acceptable factor validity. Based on the R2 value, which indicates the extent to which the variance of each latent variable is explained by the observed variables, Figure 5 presents the rankings of the variables.

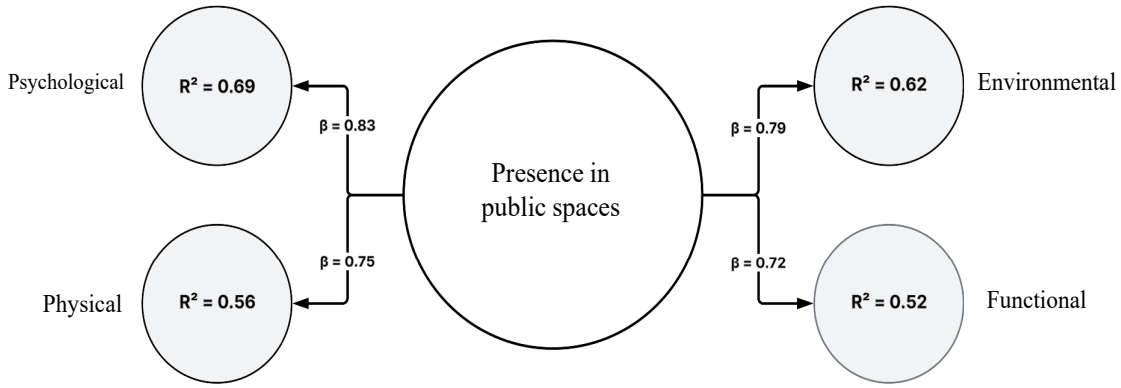

Fig. 5. Rankings of Variables using Confirmatory Factor Analysis

Table 8. Rankings of Variables based on the Effect Size in the Model

Rank	Latent Variable	Coefficient of Determination (R^2)	Significance in the Model
1	Psychological	0.6889	Highest impact
2	Functional	0.6241	High impact
3	Physical	0.5625	Medium impact
4	Environmental	0.5184	Lowest impact

The results show that the psychological variable has the greatest impact on presence in the spatial intermediary systems in Isfahan's traditional bazaar, followed by the functional variable. In contrast, the environmental variable has the least impact and requires further attention to improve spatial conditions and enhance presence.

Table 9. Fit Indices of the First-Order CFA Model

Fit Index	Obtained Value	Desirable Value	Status
CMIN/DF	2.45	< 3.00	Acceptable
RMSEA	0.06	< 0.08	Favorable
CFI	0.92	> 0.90	Favorable
TLI	0.91	> 0.90	Favorable
PCFI	0.78	> 0.50	Acceptable
PNFI	0.76	> 0.50	Acceptable

Accordingly, the CFA model exhibits a good fit, confirming the relationships between the latent variables and the measured indicators.

Table 10. Reliability and Validity of the Model

Latent Variable	CR	AVE	Status
Psychological	0.88	0.71	Favorable
Functional	0.85	0.68	Favorable
Physical	0.82	0.63	Favorable
Environmental	0.80	0.59	Favorable

The composite reliability (CR) and average variance extracted (AVE)(which assesses the convergent validity) are at acceptable levels, indicating that the conceptual research model is both structurally valid and reliable and is suitable for more advanced statistical analyses.

4.5. Mediation Analysis using Structural Equation Modeling (SEM)

According to the CFA results, the psychological variable demonstrated the highest factor loading (0.83) and the highest coefficient of determination (R2=0.6889). It was also the only variable to show a significant difference between the areas studied in the ANOVA test (P=0.020). Thus, the psychological variable was selected and examined as a mediating variable in examining the relationships between environmental, physical, and functional components with presence. A structural equation model with a Bootstrap test was employed to analyze its mediating role in detail. The results revealed that the psychological variable plays a significant mediating role. The indirect effects of environmental (β=0.24, P<0.05), physical (β=0.21, P<0.05), and functional (β=0.27, P<0.01) variables on presence through the psychological variable are significant. These findings underscore the need to enhance the quality of presence in public spaces by simultaneously addressing psychological dimensions alongside physical and functional characteristics (see Fig.6).

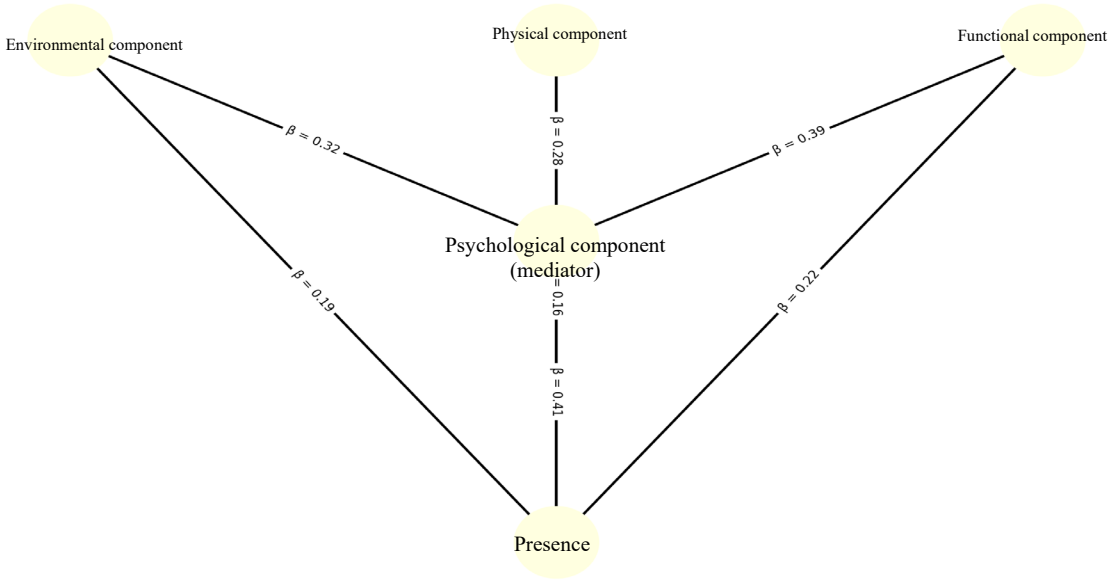

Fig. 6. Final Structural Equation Model Examining the Mediation of the Psychological Component in the Relationships between Environmental, Physical, and Functional Components with the Presence

4.6. Friedman Test for Examining the Effectiveness of the Main Components

A Friedman test was conducted to rank the components and identify the factors with the greatest impact on presence in Isfahan's traditional bazaar, as listed in Table 11.

Table 11. Friedman Test for Examining the Effectiveness of the Main Components

	Tourist Area	Economic Area	Service Area
Variable	Average Rank	Average Rank	Average Rank
Environmental	4.13	4.16	4.13
Physical	4.23	3.96	3.98
Functional	4.28	4.39	4.35
Psychological	4.58	4.25	4.09

5. DISCUSSION AND CONCLUSION

The present study aimed to evaluate the impact of spatial intermediary systems on presence indicators in public spaces, focusing on Isfahan's traditional bazaar. We employed advanced statistical methods such as confirmatory factor analysis (CFA), t-tests, ANOVA, the Friedman test, and structural equation modeling. The research examined four key environmental, physical, functional, and psychological components across three different functional areas.

The findings, illustrated through radar, bar, and heatmap charts, demonstrated that the effects of these components vary not only across the overall space but also based on the spatial-functional characteristics of each area.

Notably, the psychological variable exhibited the highest explanatory power in both the CFA and mediation analysis using SEM. It was identified as a mediating factor between the physical, environmental, and functional components and the perceived quality of presence. This reinforces the importance of mental experience, sense of place, and perceptual interaction in historical spaces, suggesting that successful design in valuable contexts requires not just optimizing physical and functional aspects but also enhancing sensory-semantic layers.

5.1. Results of Component Analysis in the Tourist Area (Shah Square and Bazaar)

Statistical analyses indicated that the psychological component achieved the highest mean in the one-sample t-test and ranked first in the Friedman test. Moreover, with a high factor loading ($\beta = 0.83$) and a high coefficient of determination ($R^2 = 0.689$), it was recognized as the most effective factor in promoting presence. The significant difference between this area and the other two areas regarding this component was also confirmed through ANOVA ($p = 0.020$) and Tukey post hoc tests. This superiority can be attributed to the perceived quality, historical structure, and cultural richness of this area, which has elevated the spatial experience to an emotional and meaningful level (Fig. 7).

Visual analyses based on the Friedman test (including bar, radar, and heatmap charts) corroborate that this area has the highest level of psychological understanding. These findings align with contemporary conceptual frameworks such as the "Place Identity and Collective Memory" theory by Manzo and Perkins (2016), the "Environmental Perception and Meaning" theory by Simon (2018), and the "Experience-Based Design" model by Montgomery (2020) and Carmona (2021). These models emphasize the emotional connection individuals have with a location, the significance of lived experience, and the meaningful perception of space in fostering sustained presence.

Therefore, design policies in this area should focus on enhancing identity signs, deepening the sense of place, and improving the experience-based quality of the space. It is recommended to prioritize interventions such as reinforcing symbolic elements, rearranging cultural components, and applying place-based design with a focus on collective memory.

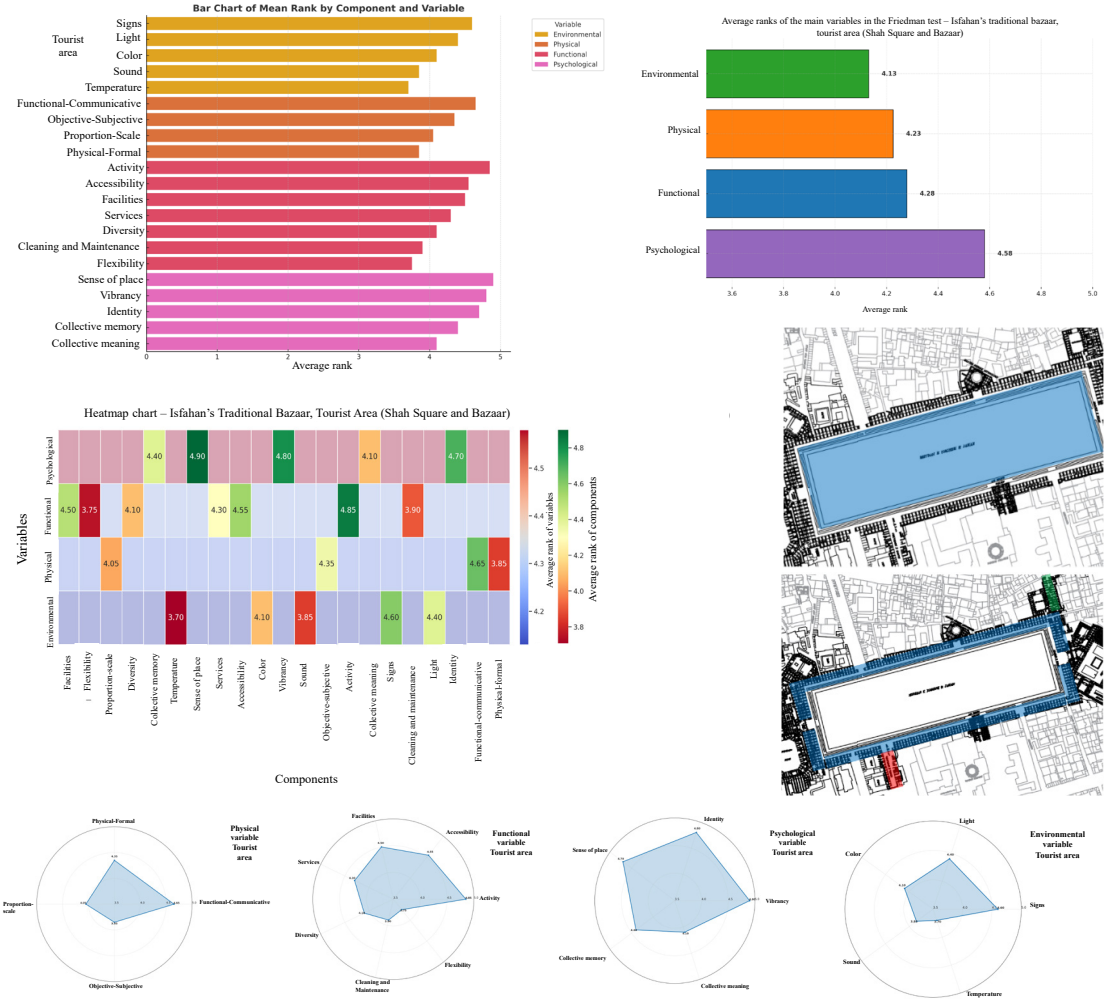

Fig. 7. Bar, Radar, and Heatmap Charts; Rankings of Components and Variables in the Friedman Test for the Tourist Area of Shah Square and Bazaar

5.2. Results of Component Analysis in the Tourist-Economic Area (Qaysariyah Bazaar)

In the Qaysariyah area, which features a blend of tourist, service, and economic functions, the results showed that the functional component ranked highest in the Friedman test (average rank = 4.39) and also had a significant mean in the t-test (3.70; $p < 0.001$), making it the most effective factor in promoting presence. This component includes indicators such as accessibility, quality of services, and economic activities, which play a crucial role in attracting users and encouraging them to remain in the dense and busy context of this area. Furthermore, the psychological and environmental components performed at a relatively favorable level. Regarding these two components, the Tukey test showed a significant difference between Qaysariyah and Shah Square in the psychological variable ($p = 0.03$). However, no difference was observed between this area and the service area. This finding suggests that presence in Qaysariyah is primarily dependent on the functionality of the space. While environmental and psychological perceptions do reinforce presence in this area, its depth of identity is not as profound as that of the historical Shah Square (Fig.8).

Analytical charts, including bar, heatmap, and radar charts, confirm that indicators such as activity, accessibility, amenities, and spatial flexibility- particularly at intersections and chahar suqs- carry the highest functional weight. These results align with theoretical frameworks such as Montgomery's (2020) "Functional-Experiential Design" model, Gao and Liu's (2023) "Hierarchy of Perception of Movement in Urban Spaces" model, and Carmona's (2021) "Experience of Public Space" perspective. Therefore, design strategies in this area should prioritize improving the functionality of the space while enhancing perceptual elements. This includes developing public amenities, improving movement flow, increasing spatial flexibility, and incorporating urban art elements to strengthen the sense of place.

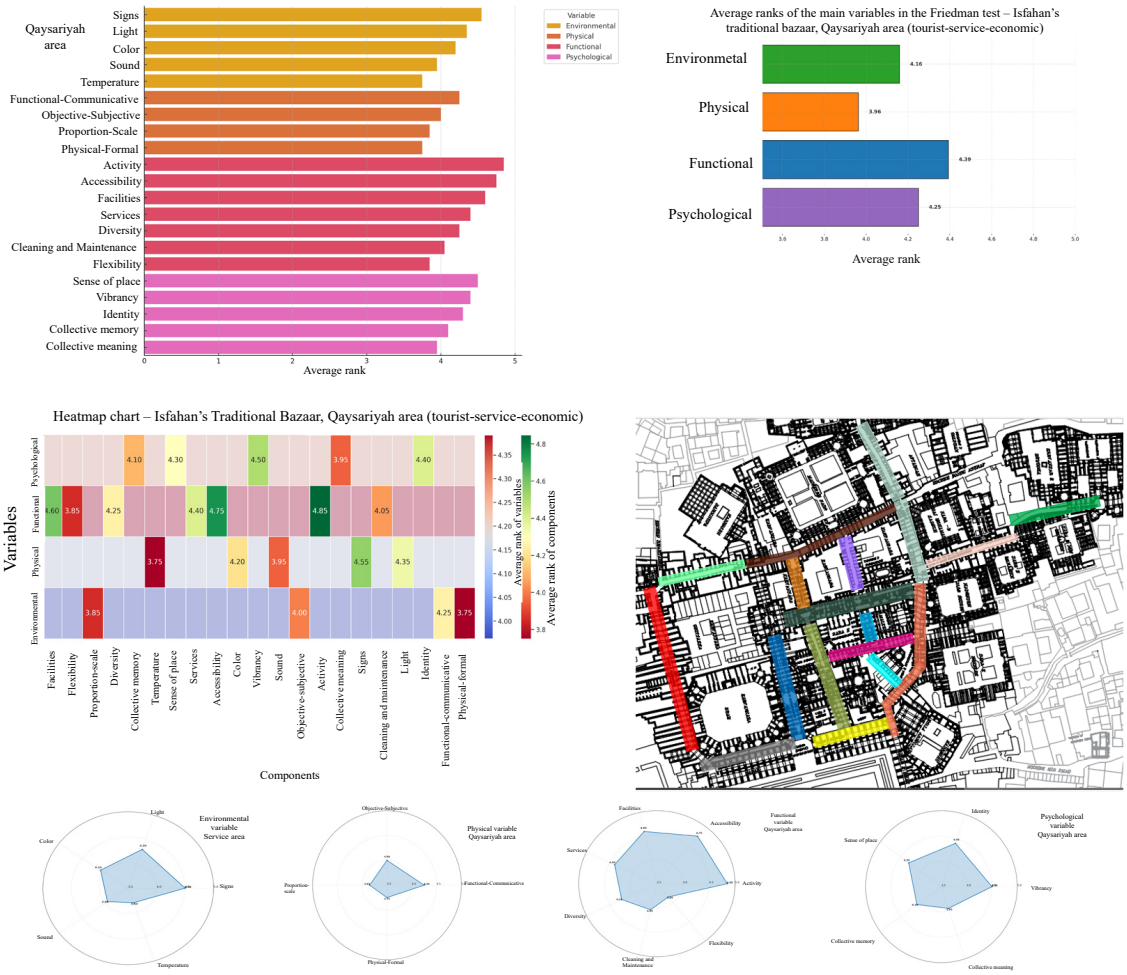

Fig. 8. Rankings of Components and Variables in the Friedman Test for the Qaysariyah Bazaar

5.3. Results of Component Analysis in the Service Axis (from Dar-e-bagh Rasteh to Nezamiyah and Kohne Square)

In the service-local area, which aims to meet daily needs and local interactions, the results of the Friedman test demonstrated that the functional variable with the highest average rank (the average of its components varies from 3.85 to 4.80) has the most significant impact on presence. Specifically, components such as "activity" (4.80), "accessibility" (4.65), and "amenities" (4.55) are crucial for attracting users and encouraging them to linger in this axis. The second most influential variable pertains to the environmental factors, with key components such as "signs" (4.50) and "light" (4.30), indicating the importance of environmental perception and spatial guidance in facilitating movement and interaction.

Conversely, the psychological variable received the lowest average rank among the four variables. Although components such as "vibrancy" (4.30) and "identity" (4.20) performed relatively well, overall, this variable had the lowest impact on the presence of users in this area compared to others. These findings resonate with studies by scholars like Greenwich (2022), Chen et al. (2023), and Qi et al. (2024), which suggest that in spaces devoid of significant cultural-historical context, environmental and functional factors play a more prominent role in enhancing interaction and encouraging users to linger (Fig.6).

Visual analyses- utilizing bar, radar, and heatmap charts- reflect a similar pattern. Functional and environmental indicators are rated favorably, while psychological components (such as identity, collective memory, and collective meaning) are rated lower. Additionally, results from the mediation analysis using SEM indicate that strengthening the psychological component can indirectly reinforce the effects of both environmental and functional components. This finding is consistent with the viewpoints of Whyte (1980), Smith et al. (2023), and Riccardi (2023), who argue that improving mental experience can enhance social interaction and spatial lingering, even in function-based spaces. Therefore, proposed strategies to foster presence in this area should focus on developing flexible spaces, enhancing

the legibility of routes, designing pause areas, and reinforcing local identity components to improve the overall quality of spatial perception while preserving the functionality of the space.

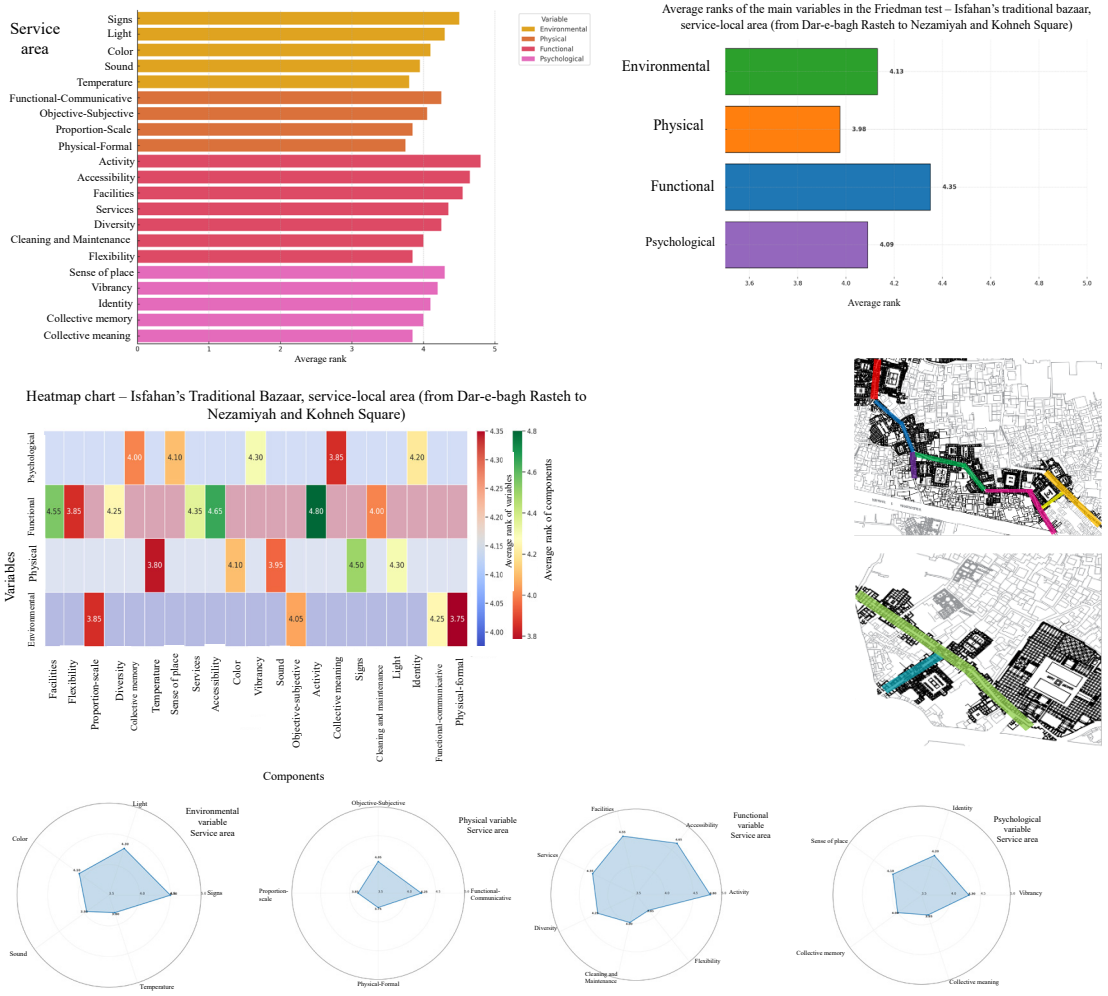

Fig. 9. Rankings of Components and Variables in the Friedman Test for the Service Area

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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The authors commit to observe all the ethical principles of the publication of the scientific work based on the ethical principles of COPE. In case of any violation of the ethical principles, even after the publication of the article, they give the journal the right to delete the article and follow up on the matter.

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The authors state that they have directly participated in the stages of conducting research and writing the article.

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