

# **Developing Design Strategies for Visual Elements of Urban Space to Enhance Pedestrian Street Vitality**

## ***A Design-Oriented Approach; Case Study: Chamran Pedestrian Street, Shiraz***

### **Abstract**

This study investigates the role of visual design elements in urban environments in enhancing the vitality of pedestrian streets—an issue that has gained increasing importance in urban design and planning due to rapid urban expansion and the growing dominance of automobiles. Adopting a design-oriented approach grounded in a design thinking framework, the research examines Chamran Pedestrian Street in Shiraz as a case study. The conceptual model was developed through a review of the urban design literature and is structured around four dimensions: physical, activity–functional, social, and environmental. Within these dimensions, twelve visual design indicators were identified, including attractiveness, lighting, visual accessibility, diversity of urban furniture, visual permeability, improvement of pedestrian space, urban elements and landmarks, color diversity, diversity of urban façades, urban greenery, visual proportions, and reduction of visual clutter. The statistical population consists of regular users of Chamran Pedestrian Street. Data were collected through a researcher-designed questionnaire using a five-point Likert scale from 384 respondents selected through convenience sampling. The sample size was determined using Cochran's formula for an unlimited population, and the reliability of the instrument was confirmed with a Cronbach's alpha coefficient of 0.898. Considering the conceptual overlap between some questionnaire items and the concept of vitality, data were analyzed using Pearson correlation analysis. The findings indicate a positive and significant relationship between all examined visual design indicators and pedestrian street vitality. Among these indicators, the symbolic meaning of designed elements, the physical form of volumes and urban elements, the enhancement of pedestrian space, and the design of artificial elements show the strongest correlations with vitality. Finally, by combining the importance of each indicator with its current performance through Importance–Performance Analysis (IPA), priority areas for design intervention were identified, and practical design strategies were proposed to improve visual quality and enhance vitality in urban pedestrian streets.

**Keywords:** Urban Vitality, Pedestrian Street, Visual Elements, Design Thinking, Chamran Pedestrian Street, Shiraz

## Introduction

A purposeful perspective toward urban public spaces—as platforms for strengthening the social dimension of cities—has become a fundamental necessity in contemporary urban design and development. Public spaces are not merely places for circulation; they also function as arenas for social interaction, collective urban experiences, and the formation of a sense of place and belonging. In recent decades, however, rapid urban expansion and the prioritization of automobile mobility over pedestrian movement have diminished the role of pedestrians in urban environments, contributing to less active spaces and a decline in urban vitality. Consequently, enhancing the vitality of public spaces has emerged as a key concern in urban design and planning (Gol, 2008; Paumier, 2010; Gehl, 2010; Carmona, 2019; Mehta, 2019; Mouratidis, 2021; Ye et al., 2020).

Pedestrian streets, as one of the most significant types of urban public space, have considerable potential to foster social interaction, encourage optional activities, and sustain the presence of citizens in urban environments—provided that their physical and visual design responds to the perceptual and behavioral needs of users. Research indicates that the design quality of pedestrian-oriented environments can directly influence levels of social presence, everyday interactions, and perceptions of vitality in urban spaces (Gehl, 2010; Carmona et al., 2018; Mehta & Bosson, 2021).

Among the various factors influencing vitality, the design of visual elements in the urban environment—including lighting, color diversity, street furniture, façade quality, the presence of urban greenery, and the reduction of visual clutter—plays a significant role in shaping users' positive perceptions of space. By enhancing visual attractiveness, environmental legibility, and perceived safety, these elements can encourage users to spend more time in public spaces and thereby contribute to increased urban vitality (Lynch, 1981; Landry, 2000; Ewing & Handy, 2009; Carmona, 2019; Mouratidis, 2021).

In recent years, greater attention has been given to human-centered approaches in urban design processes. In this regard, the design thinking approach, with its emphasis on understanding users' needs, defining problems, and developing creative solutions, provides an appropriate framework for linking users' spatial experiences with design decisions (Brown, 2009; Liedtka, 2018; Micheli et al., 2019). Nevertheless, the systematic application of this approach to connect measurable indicators of visual design with perceived vitality in pedestrian streets—particularly in the context of Iranian cities—has received limited attention. In this respect, Chamran Boulevard in Shiraz, as one of the city's major recreational, medical, and social corridors with substantial pedestrian activity, offers an appropriate context for examining this issue.

Accordingly, this study aims to develop a conceptual model based on visual design indicators derived from the literature and to test it empirically in Chamran Pedestrian Street in order to address the following question: What is the relationship between the design of visual elements in urban spaces and the enhancement of vitality in pedestrian streets? The contribution of this research can be described from three perspectives. First, it proposes an analytical framework that organizes visual elements of the urban environment into twelve measurable indicators across four dimensions: physical, activity-functional, social, and environmental. Second, it examines the relationship between each of these indicators and perceived vitality, enabling the prioritization of design interventions. Third, by focusing on the context of an Iranian city and a highly frequented multi-functional corridor, the findings provide insights that may inform the design and management of similar pedestrian streets. It should be noted that the individual indicators examined here (e.g., lighting, greenery, façade diversity) are, on their own, well established in the prior literature; the contribution of this study is therefore not the discovery of new indicators but the integration of these previously fragmented indicators into a single, empirically testable four-dimensional model, combined with a structured design-thinking-

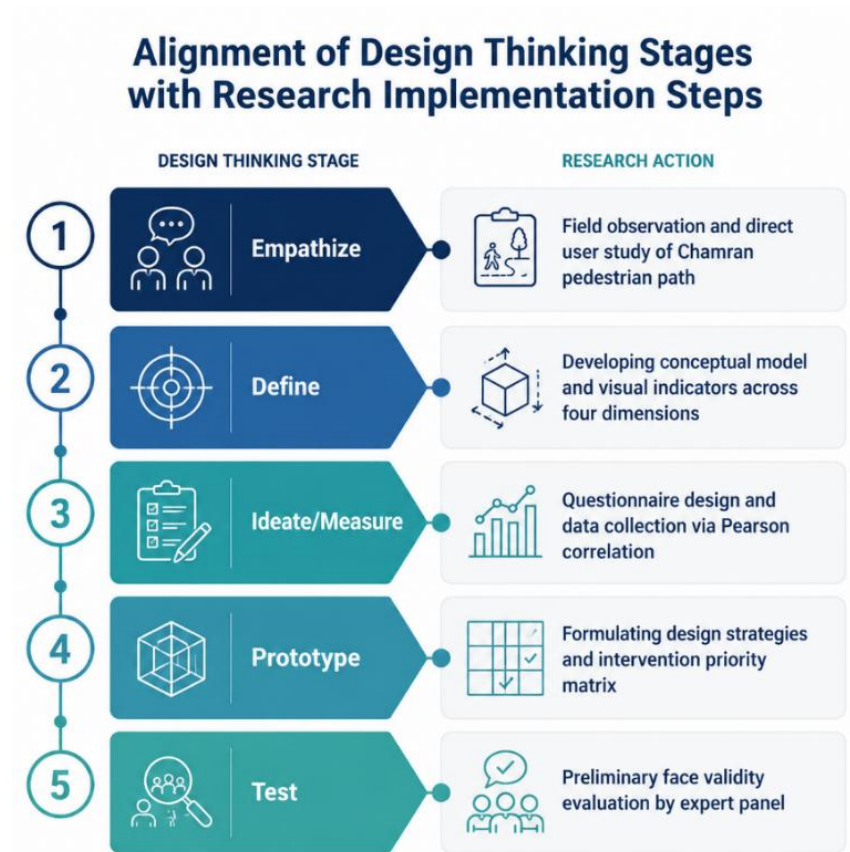
informed process and an Importance-Performance prioritization step, applied to a high-traffic Iranian pedestrian corridor where such an integrated approach has not previously been reported.

- **Design Thinking Steps in the Research Process**

In terms of data collection and analysis, this study adopts a quantitative–perceptual approach, relying on a questionnaire survey to capture users’ perceptions. Nevertheless, the overall research process—from identifying the problem to proposing design solutions—is structured according to the five stages of Design Thinking (Brown, 2009), allowing the statistical findings to be directly linked to practical and implementable design strategies.

The first two stages of this process—empathize and define—were conducted through field observations and a review of the theoretical literature (Figure 1). These stages helped develop an understanding of users’ spatial experiences and clarify the main research problem. Based on this foundation, the subsequent stages—ideate, prototype, and test—were operationalized by identifying visual design indicators from the literature, translating them into measurable questionnaire items, and empirically examining their relationship with perceived urban vitality. This structured process enabled the research to move systematically from understanding users’ experiences toward generating design-oriented strategies for enhancing vitality in pedestrian streets. It should be noted that this study adapts, rather than fully replicates, Brown’s (2009) canonical Design Thinking cycle: given the perceptual, questionnaire-based nature of the research, the Ideate stage is operationalized as the deductive selection of visual indicators rather than open-ended solution generation, and Prototype/Test are operationalized as the empirical assessment of users’ perceptions of the existing environment and the subsequent IPA-based prioritization of design strategies, rather than the iterative testing of a physical prototype. This adapted use of the Design Thinking sequence is treated as a structuring device for organizing the research process—from problem understanding to design recommendations—rather than as a claim that a full iterative, participatory Design Thinking cycle was conducted.

To make this correspondence fully explicit and reproducible, each Design Thinking stage is mapped below to its concrete operationalization in this study: Empathize was operationalized through direct field observation of user behavior along Chamran Pedestrian Street; Define was operationalized through the literature-based identification of the research problem (the gap between visual design quality and perceived vitality); Ideate was operationalized as the deductive, criterion-based selection of the twelve visual design indicators described below (rather than open-ended solution generation); Prototype was operationalized as the translation of these indicators into a measurable questionnaire instrument (the twenty-two items in Table 2); and Test was operationalized as the empirical assessment of the instrument through Pearson correlation analysis and the subsequent Importance-Performance prioritization of design interventions. This mapping is offered as a transparent structuring device for the research workflow; it is not presented as evidence that a full participatory, iterative Design Thinking process (e.g., with physical prototyping and iterative user testing of built interventions) was undertaken, and the manuscript does not claim methodological novelty from Design Thinking itself.



**Figure 1:** Correspondence between the stages of design thinking and the operational steps of the research<sup>1</sup>

## Theoretical Framework and Literature Review

In this section, the key concepts related to the research topic are examined in order to clarify the conceptual model of the study. First, the concept of urban space and its relationship with urban vitality are discussed. Then, pedestrian streets are considered as spaces that facilitate the formation of social life. Subsequently, the role of visual design elements and the indicators influencing the enhancement of vitality in urban spaces are examined. Finally, through a review of relevant national and international studies, an appropriate theoretical framework for the present research is established.

### • Urban Space, Design, and Vitality

Urban space in the urban design literature is defined as a setting in which the public activities of collective life take place; streets, squares, and parks provide the context for the formation of human activities (Bahreini, 1998). A vibrant urban space is one that, across a wide range of hours throughout the day and night, attracts a diverse range of people—voluntarily rather than by obligation—to be present and remain within it (Khastou & Rezvani, 2010).

Recent studies also identify urban vitality as an important indicator of the quality of public spaces, closely associated with the degree of human presence, diversity of activities, and social interactions within the urban environment (Ye et al., 2020; Mouratidis, 2021; Mehta & Bosson,

<sup>1</sup> All figures are based on the authors' original research and field survey data. Figures 2 and 3 are schematic diagrams constructed directly from the study's own indicator set (Table 2); AI-assisted graphic tools were used only for stylistic rendering of illustrative figures (e.g., Figures 1, 4–7), not for generating analytical content.

2021). Table (1) summarizes key definitions of urban vitality from the perspectives of urban design theorists.

**Table 1:** Definition of Vibrant Urban Space from the Perspective of Theorists

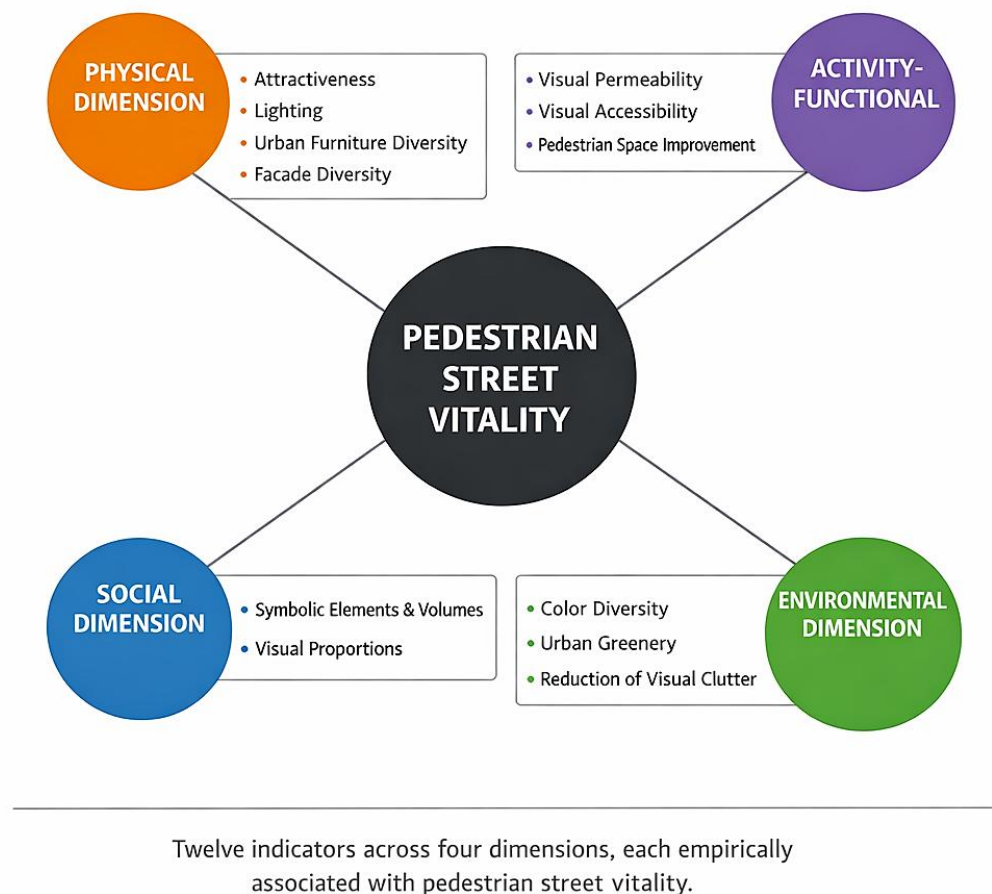
| Theorist           | Year | Key Definition Focus                                                                                       |
|--------------------|------|------------------------------------------------------------------------------------------------------------|
| Jacobs             | 1961 | Possibility of beneficial interactions and encounters among people                                         |
| Lynch              | 1981 | Compatibility of the environment with the biological and life needs of humans and other living beings      |
| Lang               | 1987 | Degree of environmental compatibility with activities such as meeting, watching, and eating                |
| Jacobs & Appleyard | 1987 | Possibility of comfortable and high-quality urban living                                                   |
| Landry             | 2000 | Useful density, diversity, accessibility, safety, identity, and creativity as conditions of a livable city |
| Gehl               | 2011 | Preference for staying and lingering in space rather than passing through quickly                          |
| Ye et al.          | 2020 | Vitality as the intensity and diversity of human activities in urban spaces                                |
| Mouratidis         | 2021 | Relationship between built environment quality, social presence, and urban quality of life                 |
| Mehta & Bosson     | 2021 | Social interactions and active presence of citizens in public spaces as indicators of vitality             |

A comparative review of these definitions indicates that, despite differences in terminology, three main commonalities can be identified among them. First, they all regard vitality as a behavioral phenomenon dependent on users' voluntary choice, rather than merely compulsory presence (Jacobs, 1961; Gehl, 2011). Second, they consider the physical–design quality of the environment as a necessary, though not sufficient, precondition for achieving vitality (Lynch, 1981; Lang, 1987). Third, they identify diversity and multifunctionality of space as reinforcing factors (Landry, 2000). Recent studies also show that an appropriate combination of physical, activity-based, and perceptual characteristics of space can enhance social presence and urban vitality (Mehta & Bosson, 2021; Mouratidis, 2021).

The main distinction among these perspectives lies in their level of analysis: Jacobs and Gehl focus on users' everyday micro-scale experiences at the pedestrian scale, whereas Landry analyzes vitality at the macro scale of urban competitiveness. The conceptual model of the present study is formed by integrating these two levels of analysis—micro and macro—within four dimensions of visual design (Figure 2).

The four dimensions were derived and operationalized as follows. The Physical dimension groups indicators describing the tangible built form of the street—urban elements and landmarks, urban furniture diversity, and visual proportions—and corresponds primarily to Lynch's (1981) micro-scale emphasis on legible physical form. The Activity-Functional dimension groups indicators describing how the space accommodates and displays use—attractiveness (commercial, cultural, and artificial element design), visual permeability, and pedestrian-space improvement—linking Jacobs's (1961) and Gehl's (2011) micro-scale behavioral focus to observable design attributes. The Social dimension is represented through the symbolic and legible design of elements and volumes, capturing the meaning-based, identity-related indicators emphasized by Landry (2000) at a more macro, city-image scale. The Environmental dimension groups indicators describing ambient and sensory conditions—lighting, color diversity, façade diversity, greenery, and reduction of visual clutter—linking micro-scale perceptual comfort (Gehl, 2011) to the macro-scale environmental-quality criteria described by Landry (2000). In this way, each dimension deliberately combines the micro-

scale, everyday-experience perspective of Jacobs and Gehl with the macro-scale, city-competitiveness perspective of Landry, rather than treating the two levels as separate or competing frameworks; the interaction between the two levels is that macro-scale attributes (e.g., city-wide symbolic identity, environmental quality standards) are made measurable at the micro, street-user scale through the twelve indicators, and the empirical findings in the Discussion are interpreted at the micro (individual indicator) level while their aggregate pattern is discussed for its implications at the macro (city-identity) level



**Figure 2:** Conceptual Model of the Research: Relationship between Visual Design Dimensions and Indicators and Pedestrian Street Vitality

### • Pedestrian Streets as Vibrant Urban Spaces

A pedestrian street, as an axis in which full or relative priority of movement is given to pedestrians, is considered one of the most effective design tools for enhancing urban vitality; this is because it enables the emergence of optional and social activities at the human scale—activities that are regarded in the urban design literature as among the main foundations for the formation of vitality in public spaces (Ye et al., 2020; Mehta & Bosson, 2021).

The design quality of pedestrian streets can be examined within the framework of Built Environment Quality, in which land use, accessibility, spatial organization, and physical form shape users' perceptual experience of the environment (Mouratidis, 2021). However, recent studies suggest that these objective walkability features do not always correspond to actual walking behavior (He & He, 2024).

In this regard, the visual and perceptual quality of the street environment plays an important role in shaping Perceived Urban Vitality, since features such as visual attractiveness, diversity

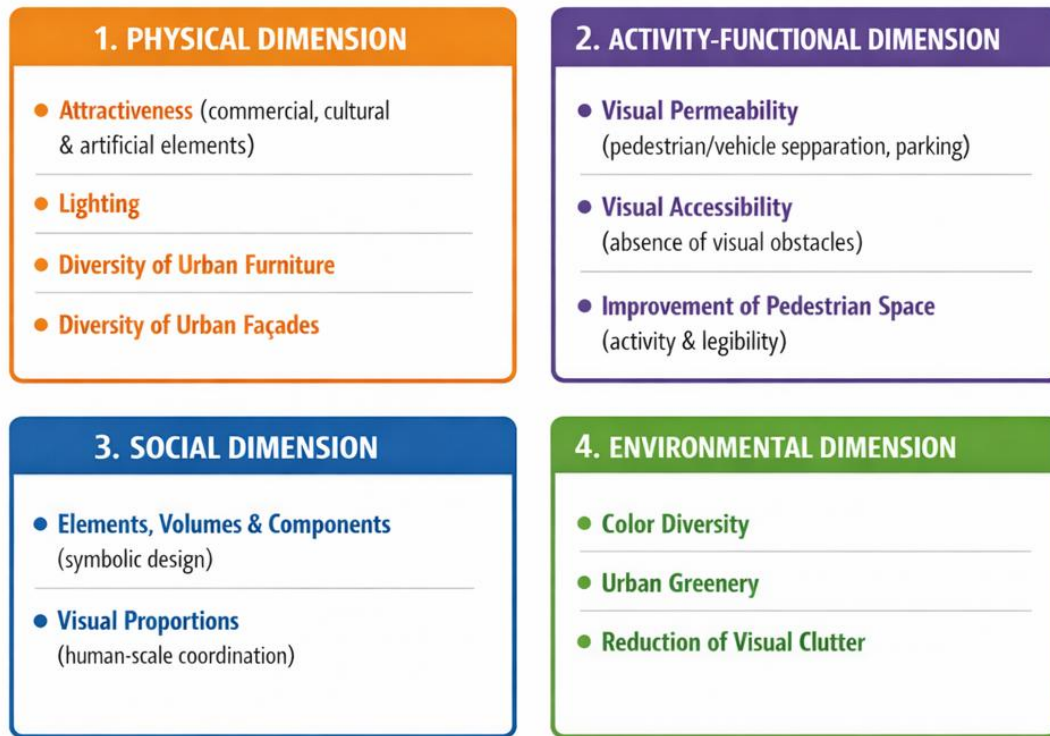
of spatial elements, and environmental design quality can strengthen users' presence and social interactions in space (Kim & Park, 2020). Recent empirical evidence also confirms this relationship; for example, studies employing street-view image analysis and mobile-based data have demonstrated that users' subjective perception of visual quality—or the objective attractiveness of the streetscape—has a significant correlation with the level of pedestrian presence and activity (Ai et al., 2024; Dong et al., 2023).

- **Visual Element Design and Indicators Related to Vitality**

Visual elements refer to the set of visible and designed characteristics of the environment—such as color, light, form, texture, and the composition of components—that directly influence users' perception and emotional responses to space (Ai et al., 2024; Kim & Kim, 2022; Mouratidis, 2021). Recent studies show that the perceptual and aesthetic quality of the street environment can have a significant effect on users' level of presence, social interactions, and spatial experience, thereby contributing to the enhancement of vitality in public spaces (Mehta & Bosson, 2021; Ye et al., 2020).

To avoid conceptual overlap among the categories used throughout this study, an explicit hierarchical relationship is defined. “Visual elements” is the superordinate category, denoting the full set of visually perceivable design attributes of the streetscape (color, light, form, texture, and composition). Within this superordinate category, “urban elements and landmarks” refers to discrete physical objects and focal features (e.g., monuments, distinctive built forms); “urban furniture” is treated as a specific, movable or fixed functional subset of urban elements (e.g., benches, lighting fixtures, planters); “symbolic elements” is a cross-cutting attribute describing the meaning or cultural association carried by any of the above (an urban element, a piece of furniture, or a façade can each carry symbolic value); and “spatial components” refers to the organizational and proportional relationships among these elements within the streetscape (e.g., visual permeability, human-scale coordination), rather than to the elements themselves. Urban furniture is therefore treated as a subset of urban elements, not as an independent analytical dimension, while symbolism and spatial organization are treated as attributes that can apply across element types rather than as separate physical categories. This hierarchy underlies the grouping of indicators in Table 2 and Figure 3.

Based on a review of the theoretical literature and its adaptation to the characteristics of urban pedestrian streets, twelve visual design indicators affecting vitality were identified through a deductive selection process. Candidate indicators were first compiled from the theoretical frameworks of Gehl (2011), Lynch (1981), and Landry (2000) together with the empirical studies reviewed in the preceding section; an indicator was retained only if (i) it referred to a visually perceivable design attribute rather than a purely functional or managerial one, (ii) it had been empirically associated with vitality or a closely related construct (e.g., attractiveness, walkability, sense of place) in at least two independent sources, and (iii) it was applicable and observable within the physical context of an Iranian pedestrian street such as Chamran Boulevard. Indicators that were redundant with one another, context-specific to non-comparable settings, or not amenable to visual assessment (e.g., purely regulatory or managerial factors) were excluded at this stage. This process yielded the twelve indicators organized into four dimensions: physical, activity–functional, social, and environmental. These indicators were then applied in the research questionnaire (Figure 3).



Twelve indicators, organized across four dimensions (based on Table 2).

**Figure 3:** Visual Design Indicators Affecting the Vitality of Pedestrian Streets

### • Literature Review

Studies conducted in Iran have primarily focused on exploring the relationship between physical–visual design components and the vitality of urban spaces at the neighborhood or pedestrian axis scale. Notably, Pakzad’s (2006) Urban Space Design Guide for Iran remains a key national reference in this regard, offering comprehensive design strategies and policy guidelines—covering furniture, lighting, greenery, and façade treatment—for enhancing the vitality of Iranian public spaces; several of the visual indicators examined in the present study (e.g., lighting, urban furniture, greenery) draw on the categories proposed in this guide. For instance, Bazvandi and Shahbazi (2014), in their study of Sepahsalar Pedestrian Street in Tehran, demonstrated that factors such as vegetation, water features, proper lighting, and pedestrian safety are among the most significant indicators affecting vitality. Similarly, Pirauli (2014), in an examination of Golsar Street in Rasht, highlighted the role of facade color in increasing visual diversity and attractiveness. Furthermore, Ghorbanpour et al. (2018), in their study of Alam-ol-Hoda Pedestrian Street in Rasht, showed that activity diversity had the highest contribution to vitality, while climatic comfort had the lowest. More recent studies have reinforced these findings; for example, Akrasardashti and Sajjadzadeh (2021) identified the creative design of visual elements as a prerequisite for vitality in creative cities, Hosseini et al. (2021) introduced physical design quality as a key factor influencing pedestrian presence, and Heydarzadeh and Haghi (2021), comparing pedestrian streets in Shiraz, reported vitality as the most critical factor in the quality of these spaces.

Methodologically, the observation of user behavior in public spaces—a technique first popularized in Whyte's (1980) classic studies on urban plazas—remains a valid approach for analyzing patterns of presence and activity in urban environments.

Internationally, recent research has utilized perceptual data and street-level imagery to more precisely examine the relationship between visual design quality and urban vitality. For example, Kim and Park (2020) demonstrated that visual characteristics and the density of commercial elements in the streetscape influence perceived vitality. Chen et al. (2023), using deep learning techniques, introduced visual clutter as an indicator for assessing street design quality, and Ai et al. (2024) demonstrated that elements with symbolic value more effectively capture pedestrian visual attention. Moreover, emerging studies indicate that the perceived quality of public spaces is positively correlated with the sense of social belonging and the level of urban interactions (Ramos-Vidal & Domínguez de la Osa, 2024; Mouratidis, 2021).

In summary, this literature review reveals that although the impact of various visual design components on vitality has been confirmed in numerous studies, few have examined these indicators comprehensively as an empirically testable model within a high-traffic Iranian pedestrian street. The present research seeks to address this gap by focusing on the Chamran Pedestrian Street in Shiraz through a design-oriented approach.

## **Methodology**

This research is applied in its objective and descriptive-analytical in its method, adopting a design-oriented approach. The statistical population consists of regular users of Chamran Pedestrian Street in Shiraz—individuals with daily or weekly experience using this axis. Given that the exact size of this population is uncountable, the sample size was calculated using Cochran's formula for an infinite population (at a 95% confidence level and a 0.05 margin of error), resulting in 384 participants. A convenience sampling method was employed: questionnaires were distributed in person at various points and times along Chamran Pedestrian Street, and simultaneously, an online version of the questionnaire was distributed among identified users of this space (142 in-person and 242 online).

The content validity of the research instrument was evaluated prior to implementation by a panel of five university professors specializing in urban design and planning. In addition, a pilot study was conducted with a preliminary sample of respondents prior to full-scale data collection to assess item clarity, response time, and the practical administration of the questionnaire; minor wording revisions were made to the final instrument based on this pilot phase. To quantitatively assess content validity, the Content Validity Ratio (CVR) was calculated based on the Lawshe (1975) formula. Given the panel of five experts, the minimum acceptable CVR threshold is 0.99. All questionnaire items achieved a CVR of 1.0 (indicating complete consensus among the five experts). Furthermore, the Item-level Content Validity Index (I-CVI) for all items ranged between 0.80 and 1.00, and the Scale-level Content Validity Index (S-CVI/Ave) was 0.92, exceeding the acceptable threshold of 0.90, which indicates the high content validity of the instrument (Polit & Beck, 2006).

The five-member expert panel was selected on the basis of disciplinary relevance to the constructs under review: all panel members held a Ph.D. in urban design or urban planning and had prior research or teaching experience related to pedestrian-environment design, ensuring familiarity with both the visual-design constructs and questionnaire-based measurement. Following the expert review, minor wording revisions were made to a small number of items to improve clarity, consistent with the pilot-phase revisions described above; no items were removed at this stage, as all items achieved a CVR at or above the Lawshe (1975) threshold. An item-level table reporting the CVR and I-CVI values for each of the twenty-two

questionnaire items is available as supplementary material and can be provided to the editor and reviewers upon request.

Regarding single-item indicators, four of the twelve research indicators (lighting, visual accessibility, color diversity, and visual proportions) were measured using a single item each (Table 2). This approach is supported in the measurement methodology literature for concrete and observable constructs—traits that users can directly perceive. Bergkvist and Rossiter (2007) demonstrated in a comprehensive study that for concrete constructs with a unified subject, a single item is comparable to a multi-item average in terms of reliability and validity. Lighting, color, and visual accessibility are traits perceived directly, aligning with this framework. Additionally, the Cronbach's alpha coefficient of 0.898 for the total instrument indicates satisfactory internal consistency across the entire scale.

**Table 2:** Visual Design Indicators and Questionnaire Items

| Indicator                                | Sub-set                                                         | Number of Items |
|------------------------------------------|-----------------------------------------------------------------|-----------------|
| <b>Attractiveness</b>                    | Commercial, cultural, and artificial element design             | 3               |
| <b>Lighting</b>                          | Lighting design fit and illumination                            | 1               |
| <b>Visual Accessibility</b>              | Lack of visual obstacles                                        | 1               |
| <b>Urban Furniture Diversity</b>         | Color/form design fit and diversity                             | 2               |
| <b>Visual Permeability</b>               | Pedestrian/vehicle separation, access, parking                  | 3               |
| <b>Pedestrian Space Improvement</b>      | Activity enhancement, beautification, legibility                | 2               |
| <b>Elements, Volumes, and Components</b> | Appearance and symbolic design concepts                         | 2               |
| <b>Color Diversity</b>                   | Diversity of color design                                       | 1               |
| <b>Urban Façade Diversity</b>            | Facade design diversity and visual variety                      | 2               |
| <b>Urban Greenery</b>                    | Diversity and type of vegetation                                | 2               |
| <b>Visual Proportions</b>                | Coordination of component design with human scale               | 1               |
| <b>Reduction of Visual Clutter</b>       | Advertising design organization, removal of unsightly additions | 2               |

The collected data were analyzed using descriptive statistics to outline the demographic profile of the sample, while the Pearson correlation test was employed as the primary method of inferential analysis to examine the relationship between each visual design indicator and urban vitality. Prior to the analysis, the normality of the data distribution was assessed and confirmed using the Kolmogorov–Smirnov test. All statistical analyses were performed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA). The use of correlation analysis was also considered appropriate given the self-reported nature of the questionnaire data, where the potential for common method bias—an issue frequently discussed in behavioral research—should be carefully considered (Podsakoff et al., 2003). Given the cross-sectional and correlational nature

of the study, the findings indicate the existence of relationships between the variables; therefore, the interpretation relies on correlational language while avoiding direct generalization to causal relationships.

The unusually high correlation coefficients observed for several indicators (e.g.,  $r = 0.925$ ,  $0.912$ ,  $0.895$ ) warrant explicit methodological comment. Two, non-exclusive explanations are considered. First, a conceptual-overlap explanation: the operationalization of urban vitality used in this study includes perceptual items (e.g., attractiveness of presence, willingness to linger) that are semantically adjacent to the symbolic- and form-related predictor items, so part of the observed association may reflect shared perceptual content between predictor and outcome rather than a purely external causal relationship; this overlap is acknowledged as a limitation of the indicator set rather than concealed. Second, a common-method-bias explanation: because all variables were collected from the same respondents, in the same session, using the same Likert-format instrument, some inflation of the correlation coefficients due to common method variance cannot be ruled out (Podsakoff et al., 2003). Procedural safeguards recommended in the literature—such as psychological or temporal separation between predictor and outcome measurement, or a post-hoc statistical test such as Harman's single-factor test—were not implemented in the present cross-sectional design, and this is acknowledged explicitly as a limitation. Consequently, the very high correlation coefficients reported here should be interpreted as indicating a strong perceptual association rather than as precise, bias-free effect-size estimates, and future work using temporally or methodologically separated measures (e.g., pairing survey-based importance ratings with independently coded behavioral-observation data) is recommended to disentangle substantive association from shared-method variance.

Based on the research questions and objectives, the study hypotheses are formulated as follows:

- (1) There is a positive and significant relationship between the symbolic and legible design of urban elements and volumes and the vitality of Chamran Pedestrian Street.
- (2) There is a positive and significant relationship between environmental design—particularly the enhancement of urban greenery and the reduction of visual clutter caused by environmental advertisements—and the vitality of this pedestrian axis.

### **Case Study: Chamran Pedestrian Street, Shiraz**

Chamran Boulevard, with an approximate length of five kilometers, is one of the most important urban corridors in Shiraz, connecting the northwestern part of the city to the metropolitan center. In addition to its transportation function, this axis hosts multiple cultural, recreational, tourism, medical, and social activities. The presence of four major medical centers and a specialized cardiac hospital along the route, together with the Qasrdašt gardens and an extensive pedestrian pathway, has long made this corridor a safe route for walking, public exercise, and cycling. Moreover, the concentration of restaurants and fast-food outlets in certain sections of the boulevard has further enhanced its recreational and tourism attractiveness (Shabani & Khalili, 2017).

From a design perspective, Chamran Pedestrian Street features relatively adequate vehicular lanes, wide sidewalks, diverse urban furniture, and active frontages. However, the overlap of pedestrian and vehicular movement in some areas, the shortage of seating spaces suitable for different user groups, and the inconsistency of lighting and environmental advertising in parts of the corridor have reduced the visual design quality and the overall user experience along this axis. The combination of diverse functions, high pedestrian traffic, and the presence of recurring social and sports events that frequently turn Chamran Boulevard into a gathering

place for citizens make this corridor a suitable case for examining the relationship between the design of visual elements and urban vitality (Figure 4).



**Figure 4:** Examples of the Existing Condition of Urban Furniture and Visual Elements in Chamran Pedestrian Street (Source: Author's Field Survey)

## Research Findings

### • Demographic Characteristics of Respondents

Out of the 384 respondents, 50.52% were male and 49.47% were female. The largest age group consisted of individuals aged 20 to 30 years (39.06%), which is consistent with the user profile of Chamran Boulevard given its combination of sports, recreational, and educational functions (Figure 5 & 6).

### • Reliability of the Measurement Instrument

The Cronbach's alpha coefficient for the entire set of 22 questionnaire items was calculated as 0.898, indicating a satisfactory level of reliability for the measurement instrument.

### • Status of Existing Visual Design Indicators in Chamran Pedestrian Street

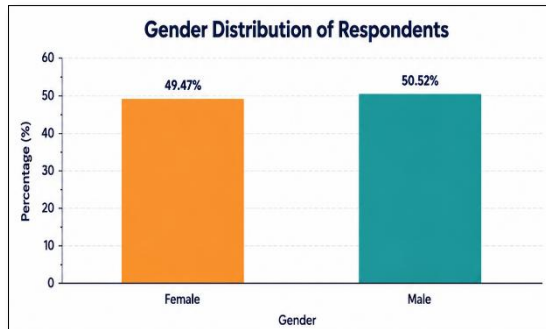
Based on field surveys and behavioral observations, the condition of visual design indicators in Chamran Pedestrian Street appears heterogeneous. Indicators such as urban furniture, coordination of components with the human scale, and the design of artificial elements are at a relatively satisfactory level. In contrast, nighttime lighting design, visual permeability at points where pedestrian and vehicular flows intersect, and the organization of environmental advertisements constitute the main weaknesses of the current design of this corridor. These qualitative findings provide a contextual basis for interpreting the correlation analysis results presented in the following section.

### • Pearson Correlation Analysis

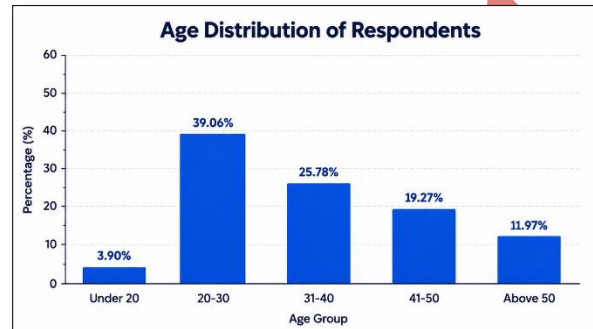
The results of the Pearson correlation test indicate that all examined visual design indicators have a positive and statistically significant relationship with the vitality of Chamran Pedestrian Street. The strongest correlation coefficients are associated with "symbolic meanings and

concepts of designed elements” (0.925), “the physical form of volumes, symbols, and elements” (0.912), “improvement of activities and beautification of the pedestrian space” (0.895), and “design of artificial elements” (0.874). The weakest coefficient relates to “commercial activities and land uses” (0.406), which, although statistically significant, shows a moderate correlation compared to the other indicators (Table 3).

The notably high correlation coefficients for symbolic meanings and the physical form of volumes can be interpreted from two perspectives. From a substantive viewpoint, this finding may reflect that within the cultural–historical context of Shiraz, users’ aesthetic perception and their symbolic associations with environmental elements constitute a strong psychological precondition for experiencing vitality and for the willingness to remain present in public space.



**Figure 5:** Gender Distribution of Respondents



**Figure 6:** Age Distribution of Respondents

**Table 3:** Pearson Correlation Coefficients between Visual Design Indicators and Urban Vitality

| Visual Design Indicator                                          | Correlation Coefficient | Sig. (2-tailed) |
|------------------------------------------------------------------|-------------------------|-----------------|
| Symbolic meanings and concepts of designed elements              | 0.925                   | 0.000           |
| Physical form of volumes, symbols, and elements                  | 0.912                   | 0.000           |
| Improvement of activities and beautification of pedestrian space | 0.895                   | 0.000           |
| Design of artificial elements                                    | 0.874                   | 0.000           |
| Separation of pedestrian and vehicular movement                  | 0.861                   | 0.000           |
| Removal of unattractive elements and additions                   | 0.816                   | 0.000           |
| Environmental color diversity                                    | 0.784                   | 0.000           |
| Unique elements and spatial legibility                           | 0.765                   | 0.000           |
| Diversity and enhancement of urban greenery                      | 0.721                   | 0.000           |
| Diversity in the color and form of urban furniture               | 0.732                   | 0.000           |
| Organization of environmental and urban advertisements           | 0.713                   | 0.000           |
| Visual diversity                                                 | 0.691                   | 0.000           |
| Appropriate accessibility                                        | 0.651                   | 0.000           |
| Existing urban furniture                                         | 0.641                   | 0.000           |
| Cultural activities                                              | 0.647                   | 0.000           |
| Type of existing vegetation cover                                | 0.615                   | 0.000           |
| Lighting                                                         | 0.589                   | 0.000           |
| Coordination of components with the human scale                  | 0.459                   | 0.000           |
| Diversity of building facades                                    | 0.483                   | 0.000           |
| Car parking                                                      | 0.472                   | 0.000           |
| Absence of visual obstacles                                      | 0.412                   | 0.000           |
| Commercial activities                                            | 0.406                   | 0.000           |

### • Hypothesis Testing

The first research hypothesis posited a relationship between symbolic design, the legibility of urban elements, volumes, and urban vitality. Pearson correlation analysis confirmed this relationship, revealing strong and significant correlations for two indicators: “symbolic meanings and concepts of designed elements” ( $r=0.925$ ) and “physical form of volumes, symbols, and elements” ( $r=0.912$ ). Therefore, the first research hypothesis is supported.

The second research hypothesis addressed the relationship between environmental design (specifically green space and the reduction of visual clutter) and urban vitality. The results indicate that “removal of unattractive elements and additions on façades” ( $r=0.816$ ), “diversity and enhancement of urban greenery and vegetation” ( $r=0.721$ ), and “organization of environmental and urban advertisements” ( $r=0.713$ ) all exhibit positive and significant correlations with urban vitality. Consequently, the second research hypothesis is also supported.

### Discussion

The findings indicate a positive and significant relationship between urban vitality in Chamran Pedestrian Street and the design of visual elements across all physical, activity-functional, social, and environmental dimensions. This vitality cannot be reduced to the dominance of a single indicator. The strongest correlations were observed with the “symbolic meanings and concepts of designed elements” ( $r=0.925$ ) and the “physical form of volumes, symbols, and elements” ( $r=0.912$ ). Subsequently, the improvement of pedestrian space, design of artificial elements, removal of unattractive additions, enhancement of urban greenery, and organization of environmental advertisements showed the most significant relationships with vitality.

The remarkable prominence of symbolic indicators over other physical and environmental dimensions in users’ perception reflects the specific cultural context of the study area. Shiraz, as a city synonymous with Iranian poetry and culture, has shaped the cognitive framework of its public space users to perceive the environment through the lens of meaning and narrative, rather than merely function or ornamentation. This finding is consistent with the distinction made by Lynch (1981) between “form” and “meaning” in the experience of urban space: a space that possesses form but lacks semantic layers intelligible to the user will produce lower perceived vitality than a space with moderate form but rich meaning. Observing this pattern within the fabric of an Iranian metropolis suggests a possible step toward the theoretical generalization of this concept in Middle Eastern urban environments, although confirming this would require replication across additional cities (Ramos-Vidal & Domínguez de la Ossa, 2024).

A further, complementary explanation concerns why symbolic and formal variables outperform seemingly more “functional” indicators such as commercial activity, cultural activity, accessibility, lighting, or human-scale coordination in this dataset. Functional indicators such as accessibility or commercial land use are largely prerequisite conditions: users routinely expect adequate accessibility and commercial provision, so variation in these attributes may matter mainly when performance is poor, producing a comparatively flatter relationship with vitality across a generally functional street such as Chamran. Symbolic and formal indicators, by contrast, are not prerequisite but differentiating: because they are unevenly distributed and more visible along the corridor, users’ perception of vitality may track more closely with their variation. This pattern is consistent with the general observation in environmental psychology that identity- and meaning-related environmental cues can carry more weight in shaping affective and evaluative responses than baseline functional adequacy.

once a minimum functional threshold has been met, though testing this threshold-based mechanism directly (e.g., through moderation analysis) was beyond the scope of the present cross-sectional design and is noted as a direction for future research.

Furthermore, the indicator “reduction of visual clutter” ( $r=0.816$ )—referring to incoherent environmental advertisements and unattractive wall additions—presents an insightful case. Despite ranking sixth in the correlation analysis, it was identified as one of the top three short-term priorities in the IPA matrix. This discrepancy between statistical ranking and operational urgency underscores the strength of the IPA approach over simple correlation analysis. By identifying indicators that possess high importance but low current performance, the IPA matrix directs intervention toward critical areas, even if their statistical  $r$  value is lower than others.

These results align with previous studies in Iranian pedestrian streets, such as those by Bazvandi and Shahbazi (2014), Piraulia (2014), and Heidarzadeh and Haghi (2021), as well as international findings by Kim and Park (2020) and Chen et al. (2023). The outcomes also resonate with the theoretical framework of Gehl (2011) and the criteria for livable cities proposed by Landry (2000), particularly regarding diversity, identity, and creativity. Consequently, design interventions in Chamran Pedestrian Street must transcend mere physical modifications and attend to the systematic management of the visual landscape to fully realize the potential of this axis for urban vitality.

Regarding theoretical innovation, this study suggests that the IPA tool—which has primarily been utilized in customer satisfaction assessment and tourism management—may have meaningful applicability as a bridge between questionnaire findings and urban design decision-making. By integrating the “Importance” axis (derived from quantitative correlation data) with the “Performance” axis (derived from field observation), this study presents an operational framework that urban managers can apply directly to resource allocation; a subject that has received limited attention in Iranian urban design scholarship.

- **Analytical Traceability: From 12 Indicators to 22 Variables to 8 Interventions**

To ensure reproducibility, the analytical path linking the twelve conceptual indicators, the twenty-two questionnaire variables, and the eight prioritized design interventions is made explicit here. First, the twelve indicators (Table 2) were each decomposed into one to three item-level questionnaire variables during the Prototype stage described above; the “Number of Items” column in Table 2 documents this one-to-many decomposition, and no items were merged or relabeled between the questionnaire design stage and the correlation analysis in Table 3—the twenty-two rows in Table 3 correspond one-to-one to the twenty-two questionnaire items. Second, the eight rows in Table 4 are not a further statistical aggregation of the twenty-two variables; rather, they are a purposive selection of the highest-priority variables carried forward into the IPA prioritization stage. Variables were carried forward into Table 4 if they met a High-importance threshold (Pearson  $r \geq 0.70$ , following conventional strong-correlation benchmarks) or, in the case of Lighting ( $r = 0.589$ ), because field observation identified it as a poorly performing but operationally low-cost intervention warranting inclusion despite moderate statistical importance; variables below this threshold were judged lower priority for the short-to-medium-term intervention plan and are not separately re-listed in Table 4, though they remain part of the broader indicator set discussed in the text. Third, to resolve terminological overlap among closely related labels: “Environmental color diversity” (Table 3,  $r = 0.784$ ) refers to the overall diversity of color across the streetscape (furniture, signage, and façades combined) and is relabeled “Façade color diversity” in Table 4 only to specify the façade-focused intervention this indicator motivates; “Diversity of building

facades” (Table 3,  $r = 0.483$ ) is a distinct construct referring to the volumetric and architectural variety of building forms rather than color, and was not carried forward into Table 4 because it fell below the High-importance threshold. These are therefore three related but non-identical constructs rather than inconsistently merged labels.

- **Proposed Model for Prioritizing Design Interventions**

To systematically integrate the strength of the statistical relationship between each indicator and urban vitality with their respective implementation status, the prioritization of design interventions is presented through an explicit, two-axis framework. This approach distinguishes the statistical importance of each indicator from its ease of implementation.

This prioritization is grounded in the well-established Importance-Performance Analysis (IPA) method (Martilla & James, 1977), which is widely employed in research on environmental quality and user satisfaction to synthesize “the importance of an attribute” with “its current performance.” Within this framework, the “Importance” axis is derived directly from the Pearson correlation coefficients reported in this study, while the “Current Performance” axis is determined based on qualitative findings from field observations. For indicators not explicitly evaluated in the field analysis, performance is recorded as “undetermined,” with further specific field investigations envisioned to complete this model. The intersection of these two axes generates the four standard IPA quadrants—*Concentrate Here*, *Keep Up the Good Work*, *Low Priority*, and *Possible Overkill*—which are then synthesized with a third, practical axis of “ease of implementation” to determine the implementation time horizon (Table 4).

It should be stated explicitly that this is a modified, three-dimensional prioritization tool inspired by, but not equivalent to, the standard Importance-Performance Analysis of Martilla and James (1977): its “Importance” axis is derived from Pearson correlation coefficients rather than users’ directly reported importance ratings, its “Performance” axis is derived from qualitative field observation rather than quantitative performance ratings collected from the same respondents, and it adds a third “ease of implementation” dimension absent from the conventional two-axis IPA grid. Findings from this framework should therefore be read as a structured, transparent prioritization heuristic rather than as an application of standard IPA. To make the quadrant assignment reproducible, the following explicit thresholds were applied: Importance was classified as Low ( $r < 0.50$ ), Medium ( $0.50 \leq r < 0.70$ ), High ( $0.70 \leq r < 0.85$ ), or Very High ( $r \geq 0.85$ ), following conventional benchmarks for correlation-coefficient strength; Performance was classified through a structured field-observation protocol using a three-point ordinal scale—Poor, Moderate, or Favorable—assigned by the research team based on the presence, consistency, and visible condition of each indicator along the full length of Chamran Pedestrian Street during repeated site visits. Indicators with High or Very High importance combined with Poor or Moderate performance were assigned to the *Concentrate Here* quadrant; High or Very High importance combined with Favorable performance was assigned to *Keep Up the Good Work*; Low or Medium importance combined with Poor performance was assigned to *Low Priority*; and Low or Medium importance combined with Favorable performance was assigned to *Possible Overkill*. The crosshair separating the quadrants therefore corresponds to the  $r = 0.70$  importance threshold on one axis and the Moderate/Favorable performance boundary on the other.

It is noteworthy that the symbolic design of elements and volumes, with correlation coefficients ranging from 0.912 to 0.925, holds the highest statistical importance among all indicators; for this reason, it falls squarely within the “*Concentrate Here*” quadrant. However, what shifts this indicator to a long-term implementation horizon is not a weak relationship with vitality, but rather the low ease of its implementation. Meaningful symbolic design for urban elements,

unlike operational tasks such as removing intrusive advertisements, requires a time-consuming process involving design competitions, consultation with the local community, and the creation of lasting artistic installations. Therefore, despite its long-term implementation priority, its immense strategic importance necessitates that planning and resource allocation begin immediately.

**Table 4:** IPA Matrix and Prioritization of Design Interventions for Chamran Pedestrian Street

| Design Indicator                                       | Importance (Pearson's r)  | Current Performance (Field Observation)                                                | IPA Quadrant          | Ease of Implementation | Implementation Horizon            |
|--------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------|-----------------------|------------------------|-----------------------------------|
| Organization of environmental and urban advertisements | 0.713 (High)              | Poor                                                                                   | Concentrate Here      | High                   | 1 (Short-term)                    |
| Lighting design                                        | 0.589 (Medium)            | Poor                                                                                   | Concentrate Here      | High                   | 1 (Short-term)                    |
| Removal of unattractive elements and additions         | 0.816 (High)              | Poor                                                                                   | Concentrate Here      | High                   | 1 (Short-term)                    |
| Redesign of pedestrian–vehicular conflict points       | 0.861 (Very High)         | Poor                                                                                   | Concentrate Here      | Low                    | 2 (Medium-term)                   |
| Façade color diversity                                 | 0.784 (High)              | Moderate (Active façades, lacking color cohesion in sections)                          | Concentrate Here      | Moderate               | 2 (Medium-term)                   |
| Enhancement of urban greenery                          | 0.721 (High)              | Moderate (Adequate vegetation along Qasrodasht gardens; weaker in central segments)    | Concentrate Here      | Moderate               | 2 (Medium-term)                   |
| Design of artificial elements                          | 0.874 (Very High)         | Relatively Favorable                                                                   | Keep Up the Good Work | Moderate               | 2 (Maintenance & Enhancement)     |
| Symbolic design of elements and volumes                | 0.925 & 0.912 (Very High) | Moderate (Formally sound but lacking coherent cultural-historical symbolism of Shiraz) | Concentrate Here      | Low                    | 3 (Long-term, Strategic Priority) |

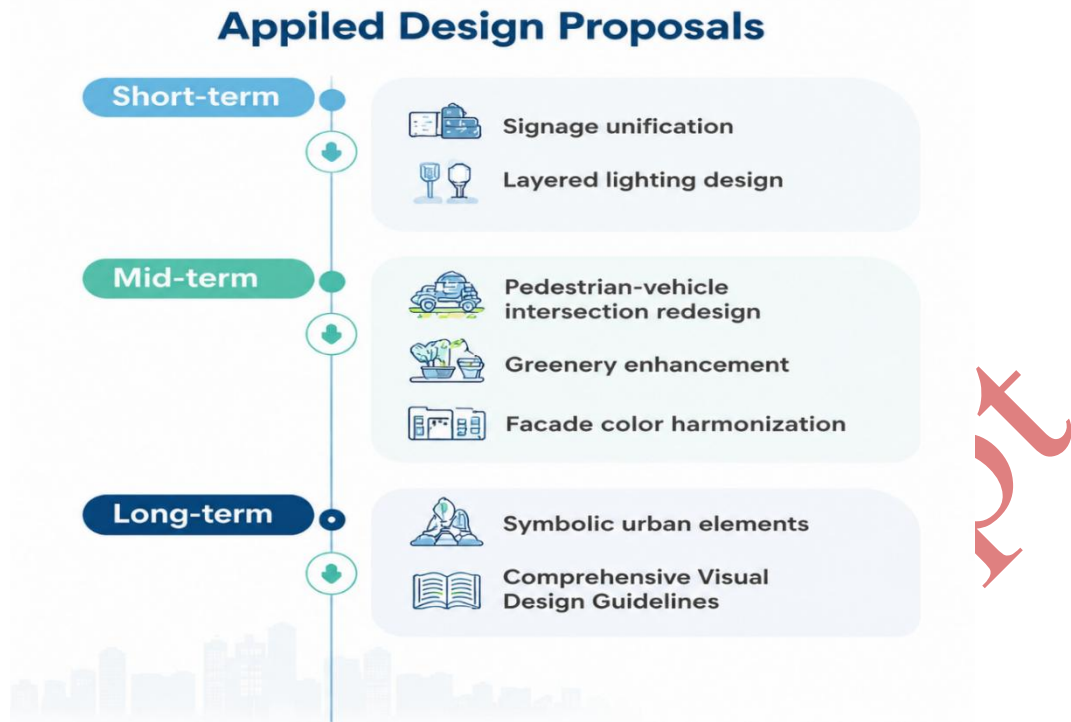
## Practical Design Recommendations

Based on the IPA prioritization model, the following design interventions are proposed for enhancing the visual quality and vitality of Chamran Pedestrian Street:

Each recommendation below corresponds directly to one or more of the eight prioritized interventions in Table 4 and is ordered by the implementation horizon assigned there: the signage/façade-addition recommendation operationalizes the “Organization of environmental and urban advertisements” and “Removal of unattractive elements and additions” rows; the layered-lighting recommendation operationalizes the “Lighting design” row; the conflict-point redesign recommendation operationalizes the “Redesign of pedestrian–vehicular conflict

points” row; the tree-canopy recommendation operationalizes the “Enhancement of urban greenery” row; the façade color-harmonization recommendation operationalizes the “Façade color diversity” row; and the symbolic-element and comprehensive visual-guideline recommendations jointly operationalize the “Symbolic design of elements and volumes” row together with the overall “Design of artificial elements” finding. These recommendations are therefore interpretive design translations of the statistical and field-observation findings summarized in Table 4, not additional variables measured independently.

- **Short-term (main segment of the Chamran axis):** Standardization and regulation of commercial signage and environmental advertisements according to a unified visual guideline aligned with the historical identity of Shiraz. This intervention should also include the removal of incoherent façade additions and the application of coordinated regulations for façade colors and materials.
- **Short-term (areas of nighttime activity near the central parks):** Implementation of a layered lighting system consisting of ambient lighting for safety, directional lighting for path legibility, and accent lighting for highlighting urban elements and vegetation. Evidence from similar Iranian pedestrian streets (e.g., Sepahsalar Street in Tehran) indicates that such interventions can significantly increase nighttime presence and activity (Bazvandi & Shahbazi, 2014).
- **Medium-term (major pedestrian–vehicular conflict nodes, particularly intersections with secondary streets):** Redesigning conflict points through the introduction of clearly defined pedestrian islands, visual separation using pavement texture and level differences, and the installation of legible wayfinding signage. This measure responds directly to the high importance of the pedestrian–vehicular separation indicator in the IPA matrix ( $r=0.861$ ) combined with its currently weak performance.
- **Medium-term (segments lacking coherent vegetation cover, particularly in the central commercial areas):** Strengthening the urban tree canopy using shade-providing species compatible with Shiraz’s semi-arid climate (e.g., plane trees and eucalyptus), establishing pocket parks in sections lacking green space, and introducing lawns and seasonal planting.
- **Medium-term (uniform façades within the administrative and medical sections of the axis):** Applying coordinated façade color schemes inspired by the climatic architecture of Fars Province (earth tones, brick hues, and mosque green), while maintaining controlled diversity to prevent visual monotony.
- **Long-term (key focal points along the axis, including the main intersection with Qasroodasht and the central segment):** Designing and installing three symbolic urban elements reflecting the historical and cultural narratives of Shiraz through an open design competition involving local community participation. These elements should convey meaningful symbolic layers understandable to a broad range of users rather than merely providing abstract aesthetic value.
- **Long-term (entire axis):** Developing a comprehensive visual landscape plan for Chamran Pedestrian Street, including a design guideline for façades, street furniture, lighting, and paving, to ensure that short- and medium-term interventions contribute to a coherent and unified visual identity (Figure 7).



**Figure 7:** Practical Design Recommendations

## Conclusion

This study contributes to the urban design literature by proposing and empirically examining a design-oriented framework that links twelve visually perceivable design indicators to the perceived vitality of pedestrian streets—a framework whose novelty lies not in the individual indicators, most of which are already established in the literature, but in their integration into a single testable model organized across physical, activity-functional, social, and environmental dimensions, and in coupling this model with a design-thinking-informed research process for an Iranian pedestrian corridor, a context in which such integrated frameworks remain scarce. By structuring the research process according to the stages of Design Thinking (Brown, 2009) in the case of Chamran Pedestrian Street, this research suggests that visual quality is associated with, and may function as an important condition for, enhanced social interaction and human presence, rather than being merely an aesthetic concern. Furthermore, the integration of Importance-Performance Analysis (IPA) provides a practical basis for urban planners to prioritize interventions by aligning perceptual importance with implementation feasibility.

While these findings offer actionable insights for urban design practice, the study acknowledges certain limitations. First, the analysis relies on cross-sectional, self-reported perception data, which supports correlational but not causal inference; accordingly, the relationships reported throughout this study should be interpreted as associations rather than causal effects. Second, although demographic characteristics of respondents (e.g., age, gender) were reported descriptively, their potential influence on the perceived importance of individual visual indicators was not statistically tested and remains an open question for future research using subgroup or moderation analysis. Third, the four-dimension structure (physical, activity-functional, social, and environmental) used to organize the twelve indicators reflects a deductive theoretical classification drawn from the literature rather than a statistically validated latent-factor structure; testing this structure with confirmatory techniques such as Confirmatory Factor Analysis or Structural Equation Modeling, ideally across multiple case-study streets, is an important direction for future research. To advance this field, future research should aim to bridge the gap between subjective perception and observed spatial behavior. Integrating longitudinal behavioral metrics—such as pedestrian flow tracking, heat maps, or experimental

approaches like immersive virtual reality (IVR) and eye-tracking—will provide a more objective understanding of how specific visual design elements influence user experience, thereby further strengthening the empirical foundations of urban design and decision-making.

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