

Research Paper

Expanding Walkability in Tehran's Historic Downtown Case Study: Streets Leading to the Imam Khomeini Square (Maidan-e Tup-khana)

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Abstract

This research explores the correlation between 'walkability' and the 'sense of place' in Tehran's streets, particularly streets leading to the Imam Khomeini square (Maidan-e Tup-khana) at the heart of historic downtown. The goal is to evaluate the walkability through a measurable method in order to prioritize strategies to enhance various aspects of the historic districts. After reviewing the extensive urban design literature, 23 measures were selected and categorized into three aspects of the place: physical, perceptual, and behavioral. Data for each aspect were then gathered through structured questionnaires administered to diverse groups of experts. An expert panel, including 30 professionals from seven fields including urban planning, urban design, urban renewal, urban sociology, transportation, architecture, and urban management, rated the streets based on their confirmed criteria. Moreover, people have been consulted on the results proposed for the future of the district. This study concludes that the sense of the place will increase by enhancing walkability. The place quality has been more balanced in pedestrianized Bab-e-Homayoun. The panel agreed that Lalehzar Street had the first priority for improving its walkability. Complete Street is a proposed model for this street confirmed by people. This research, however, recommends at least 'complete street' patterns mixed with the pedestrianization model for the studied area which might be expanded to the whole historic downtown from Maidan-e Tup-khana to Arg (citadel), then toward the first and second Tehran's fortifications. Here, Jabakhaneh Street works as the X-axis and Sabz-e-Meydan represents the Zero number of Tehran City.

Keywords: Walkability, Sense of the place, Pedestrianization, Place-making, Complete street, Traffic calming, Tehran's Maidan-e Tup-Khana (Imam Khomeini) square.

1. INTRODUCTION

Walkability has been among the urban design challenges in Iran since the arrival of automobiles in the 1930s. Driveways have been imposed into the large cities and cut the existing traditional urban fabrics to benefit the new car users. Consequently, apart from the threats to the preservation of cultural heritage areas, disappearing continuous pedestrian circulation, emerging large amounts of paved open space devoted to roadways and parking,

environmental pollution, social and urban segregation as well as health risks have happened among all the other challenges due to imitating a non-local idea in the tradition patterns (Safdie & Kohn, 1998; Iran's Urban Planning and Architecture Study and Research Center, 1995; Stoker, et al., 2015).

Even though large cities, for instance, Tehran, have witnessed several urban development projects including highways, cloverleaf interchanges, tunnels, metro, parks, and pedestrianization centers, they still suffer from the lack of appropriate walkability strategies. The modern urban layer hardly has admired the traditional achievements since

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modernization in Iran¹ (Safdie & Kohn, 1998; Moeini, 2012; Behzadfar, 2013; Etemad, 2013). Therefore, new urban strategies are essential, particularly in downtowns, to redefine new and old urban subdivisions and street patterns.

On the one hand, most of the urban strategies to deal with the issue in Iran have been based on rather traffic engineer solutions including congestion charges and restricted driving zones. Traffic engineers rarely have adjudged sociological and architectural aspects of urban fabrics. Plus the traffic-calming, complete street, and car-free (residential or non-residential) block ideas have not been among the common implemented projects in Iranian cities yet.

On the other hand, the idea of pedestrianization has mostly been limited to a single street in a linear pattern rather than considering it in a whole community and an integrated framework. Decisions have thus faced different ongoing arguments between different groups of people, urban experts, and municipalities on the reasons and criteria for street selections. Furthermore, the selected streets have usually been leading to a well-known historic square, which is then converted into a traffic roundabout, to justify architectural or historical dimensions of the place rather than socio-economical and environmental components.

Thereby, walkability, which plays the main role to enhance the quality of urban places has yet remained a serious topic to bring up with scholars in Iranian cities, especially in historic downtowns. As such, the main purpose of this paper is to methodologically analyze the walkability and to prioritize alternatives for the historic downtown in Tehran.

In this article, Imam Khomeini (Sepah or Tupkhana) roundabout has been selected as a historic area, where the first cars had shown up in the city, to measure the walkability of its major streets. A model has been used with engaging various experts in the field of traffic engineering (transportation), urban design, urban planning, architecture, urban renewal, urban sociology, and management. People's opinions have also been taken into consideration to prioritize the strategies for a re-plan the street pattern.

2. MATERIALS AND METHODS

To measure 'walkability' and discover its relation to the 'sense of the place', these two concepts were set as the independent and dependent variables for this research is conducted according to the Delphi

technique. Walkability factors in relation to the three components of the place have thus been the fundamental framework to prepare a structured questionnaire on the selected streets for an expert panel consisting of 30 professionals in the following seven fields:

- Traffic engineering
- Urban design
- Urban planning
- Urban renewal
- Urban sociology
- Urban management
- Architecture

The three components of the place were branched out into nine dimensions based on the rigorous theoretical framework of the research. Subsequently, among several walkability factors for each dimension, 23 factors were selected based on the site observation, preliminary research, and panel agreement. However, all factors for each dimension were shared with respondents in order to get accurate. Moreover, panelists, who were all well familiar with the designated site, surroundings, and municipal district, had access to documents such as photos and videos for each street to respond to the questionnaire.² The selected factors for each street were measured based on a five-level Likert-type scale. Accordingly, the score for each dimension and component was estimated. As the result, the walkability and the sense of the place for each street were figured out and scored.

After panelists measured the streets' walkability and agreed on the intervention priorities, more than 200 people³ including visitors, residents, and retailers of the area participated to share their opinions about the final decision. They were selected on both sidewalks of the prioritized street and interviewed mostly in the three rush periods.⁴

Demographically, 85.5% of men and 14.5% of women participated and most of the respondents (74%) were employed. The average age of the respondents was 40; where the youngest respondent was 20 years and the oldest was 69 years. Twenty-five percent of people were under the age of 33, half of the people were under the age of 40, and 75% of the people were under the age of 47.

² A facilitator was available for each panelist in case of requiring any further details.

³ Statistically 220 people

⁴ Morning between 6.30 to 8.30, afternoon between 12.30 to 2.30 and evening between 6 and 8

¹ There have been some efforts to re-consider rural areas as well as downtown urban renovation and heritage zone rehabilitations since the Islamic Revolution.

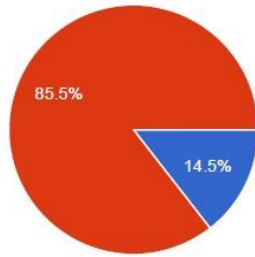


Chart 1. Pie Chart of Gender
(Respondents in Lalezar)

A. Case Study: Tehran's Imam Khomeini (Tup-khana) Square

The first fortification of Tehran, located in rural areas of Ray Town, occurred, based on an ancient Persian pattern with four main gates when Shah Tahmasp (Tahmasp King, Safavid Dynasty) ordered to surround the rural area with defensive walls in 1553. It remained a small town, however, until 1790 when chosen as the capital of the Qajar Dynasty by Agha Mohamad Khan. In 1873, a hexagonal wall with 12 major gates- three on each North, South, West, and East sides- shaped the second city's fortification, to accommodate the increased number of people,¹ under the command of Naser-Aldin-Shah (Marefat, 2004; Madanipour, 2006; Tehran Municipality, 2006).

The urban configuration had followed Isfahan's School. It consisted of a long geometric defensive wall around the city with fortified towers and gates, and Arg (citadel) with its own famous components, a grand linear Bazaar in the middle (Tehran Grand Bazaar), Sabzeh Meydan (the entrance square to the Bazaar), and a great mosque at the heart of the city and attached to the Bazaar with various squares or defined urban spaces for pedestrians to pause or move. Block A in the diagrams demonstrates the location of the Arg within fortifications (Diagrams 1 and 4). Residential districts were branched out from the Bazaar and each had its own community services, normally around local squares and plazas, such as small market places (Bazaarcheh), baths (Garmabeh), cisterns (Ab-Anbar), and mosque-schools or different religious institutes. Some other urban elements such as caravanserais, large gardens, and palaces were located within or outside of the city walls. Morphologically, the central courtyard buildings, introvert architecture, and Persian garden prototypes (Chahar-Bagh) were the major land subdivision patterns that shaped Tehran. So, the aforementioned

elements followed those sorts of configurations architecturally while major streets were extended straight, the long and wide axis with passages and streets, which worked for pedestrians or light vehicular traffics connected the buildings, squares, and plazas. New developments grew along the streets mostly from the inner gates toward the city's wall gates (Hamidi, Habibi, & Salimi, 1997; Soltanzadeh, 2013; Ghobadian & Rezaei, 2014; Khansari, Moghtader, & Yavari, 1998). Sepah Street and Square (Tup-khana), as well as Dolat District (including Lalezar, Saa'di, Ferdowsi Streets), clearly represent this type of expansion.

Imam Khomeini (Tup-khana) square, formerly called Sepah and also known as Tup-khana,² has constantly been engaged with how people moved in the city. It was created by Amir-Kabir's order as one of the primary constructions in the new Naser-Aldin-Shah's boundary attached to the historic citadel (Dolat Gate), on the northern Shah-Tahmasp's wall. It became the main intersection from which the city has grown toward the north, east, and west vastly. The square evolved through the Qajar, Pahlavi, and Islamic Republic periods (Fig. 1). Sepah square was constructed with an approximate 110 m width and 220 m length, a renaissance proportion, in ten years by Mohammad Ebrahimkhan Azarbaeijani as a new square. It was all enclosed with unified two-story buildings, functioned as an armory (Mohamzede Mehr, 2002; Ghobadian & Rezaei, 2014). However, through the ages, significant governmental buildings were gradually constructed, renovated, reconstructed, and replaced with new buildings in this historic square. These buildings include:

- Police station (Nazmiyeh or Shahr bani) on the west, which was reconstructed and renovated later on,
- The Imperial Bank of Persia (Bank-e-Shahi), the first Bank in Iran, on the east, that was reconstructed as Bazargani Bank (today is known as Tejarat Bank),
- City Hall (Baladiyeh) on the north, which was replaced by a bus terminal,³
- Telegraph house on the South, which was reconstructed as the Minister of Post, Telegraph, and Telephone, and
- Traffic center (Obor-va-moror) on the southwest, which was replaced by Imam Khomeini metro station.

² Literally means 'Armory' or 'artillery barracks'

³ At the present, the new building replicating the historical one is under construction.

¹ around 150 thousand people



Fig 1. Imam Khomeini Square (Tup-khana) Evolution in Three Periods (Mohamzede Mehr, 2002, p. 11) Scanned from the Same Source by Mahsa Sasanfar

Among the six major streets leading to this square, this research studied only south-north streets which are four historically valued streets as follows¹:

1) Lalehzar Street² (Fig. 3) at the northeast, which found its way through the beautiful and pleasant garden of tulips by Naser-Aldin Shah's decree who was amazed by Champs Elysees Avenue in Paris (Block B). Saadi Street in parallel with this street from old Dolat Gate led to the new Dolat Gate, one of the north gates of the new city wall.

From a private garden to a semi-private road and eventually a public road, it gradually accommodated entertainments, artistic, and cultural events in such a massive and mixed-use street. Therefore, it became a hub of theatres, cinemas, music centers, concerts, print journalism, posh stores, luxury hotels, coffee shops, restaurants, and cabarets. It remained a

fashionable avenue until the Islamic Revolution. Nonetheless, it is now mostly a center place for wholesale electrical goods.

2) Ferdowsi (Fig. 2), formerly known as 'Amin-al-Soultan', 'Alaodowleh' and 'Ambassadors' to the northwest, which has been the center of Tehran's currency exchange trade, was also laid out in Ilkhani garden. Several foreign embassies (Russian, English, German, Turkish, Dutch, and Belgium) relocated to this area, thus the street was also called 'Ambassadors.

3) Naser-Khosro (or Naseriyeh in Fig. 6) to the Southeast of the square, was a part of Tehran's citadel rampart. It is one of the oldest streets with several historic constructions including Dar-al-Fonon (polytechnic university), Shams-al-Emara Tower (Fig. 6, once the tallest building), first drag store, and first publication. It is currently a hub for medical equipment, books, and stationery.

4) Bab-e-Houmayoun (Almasiyeh) to the Southwest which shaped the entrance to the Arg (citadel shown as block A in the diagrams). It was

¹ Imam Khomeini (Sepah or Marizkhaneh) to the West, and Amir-Kabir (Cheragh Bargh/Gaz) to the East are not studied in this research.

² latterly means Tuliped or Tulip Garden

widened and covered with cobblestone along which there were shops and lined trees in 1871. It was amongst the first streets that were converted into an asphalt street for automobiles later on. Currently, it is pedestrianized and closed to automobiles completely. Horse-drawn streetcars, as well as carriages (horsecars), passed through this street as well as the square and all the above-mentioned streets.

Block A in this paper, diagram one, shows the citadel (Arg) fortified area since Shah Tahmasp. After removing the fortifications, it was then surrounded by Khayam Street (Jalil Abad or Jaliliyeh) to the west, Naser Khosrow to the east, and Panzdahe-Khordad (Jabakhaneh or Bozarjomehri) to the south. Bab-e-Houmayoun in the middle of the block (up to Soor-e-Esrafil intersection), as well as the Naser Khosrow Street (up to Saa'dat Alley), were studied in this research. Lalehzar and Ferdowsi were surveyed for this research from Block B up to the Molanorozi intersection (Diagram 2). These two blocks are connected with Tup-Khana Square (Diagram 1).

At the beginning of each six streets, there was a gate. Imam Khomeini Square (Maidan-e Tup-khana) was the place where the first cars showed up in the city in the 1930s during the modernization era in Reza Shah's reign. The buildings around the square transformed and the six street gates were totally removed over the course of history.

Regular city subdivision assumed as rigid as north-south orientation for the benefits of cars. According to the city density regulation, residential plots are mostly divided into 40 percent buildable land areas (to the north). The 'modern' urban interventions such as zoning, subdivisions, highways, cloverleaf interchanges, tunnels, and metro infrastructure, however, have hardly adopted the traditional existing fabric since modernization.

In the Islamic Republic period, respecting the traditional and historic centers was accounted for and focused on the plans. Currently, Bab-e-Houmayoun Street is transformed into a pedestrian zone. There have still been ongoing negotiations to convert some other streets next to Imam Khomeini Square (Maidan-e Tup-khana) into car-free zones while the rest of the streets operate as one-way streets due to the heavy traffic.

3. BACKGROUND

A. 'Walkability' and 'the Sense of the Place'

If walkability means the extent to which the built environment is friendly to the presence of people

living, shopping, visiting, enjoying, or spending time in an area (Abley, 2005), then many factors may relate it with the quality and sense of a place and pedestrian planning. Some scholars have evaluated the pedestrian environment with walkability and place quality factors without showing the correlation.

Frank Jaskiewicz, for example, has detected nine valuable points on how to measure the quality of pedestrian environment according to the three areas of aesthetics, safety, and ease of movement in the space: enclosure or definition, the complexity of path network, building articulation, the complexity of spaces, transparency, buffer, shade trees, overhangs (awnings, varied rooflines), and physical components or conditions (Jaskiewicz, 1999).

The place sense, as David Counter and John Punter suggest, consists of three components: physical, behavior, and perceptual aspects (Canter, 1974; Punter & Carmona, 1997). Each aspect is researched by scholars. Matthew Carmona extends the three aspects into eight dimensions (Carmona, 2001). Adding up the 'optional' behavior by John Gehl (1971), we would consider nine dimensions at all for assessing the sense of the place.

Accordingly, walkability factors could be associated with each place dimension. For instance, among several walkability factors, street connectivity, design, aesthetics, footpath quality, street furniture, density, building variety, transparency, orientation and proximity of homes, and street over (Frank, Sallis, & Terry, 2006; Wang, 2013; Ramirez, et al., 2006) can be accounted as the physical aspect of the place. Similarly, factors such as mixed land-use, retail floor area ratio, place-making, plenty of places to go to near the majority of homes (Frank, Sallis, & Terry, 2006), buffers (on-street parking or bike lanes), pedestrian crossings, nearby local destinations, traffic volume and speed, access to mass transit (Ramirez, et al., 2006) distance to transit (Wang, 2013) are related to activities in the place. Table 1 summarizes the walkability factors in association with the sense of the place and indicates that the presence of trees and vegetation, air quality, shade or sun in appropriate seasons, and wind conditions might be classified among ecological aspects likewise¹.

¹ In some cases, it is not easy to classify a factor into only one specific category. In this case, the understanding of the factor is explained and the factor is put in more than one category.

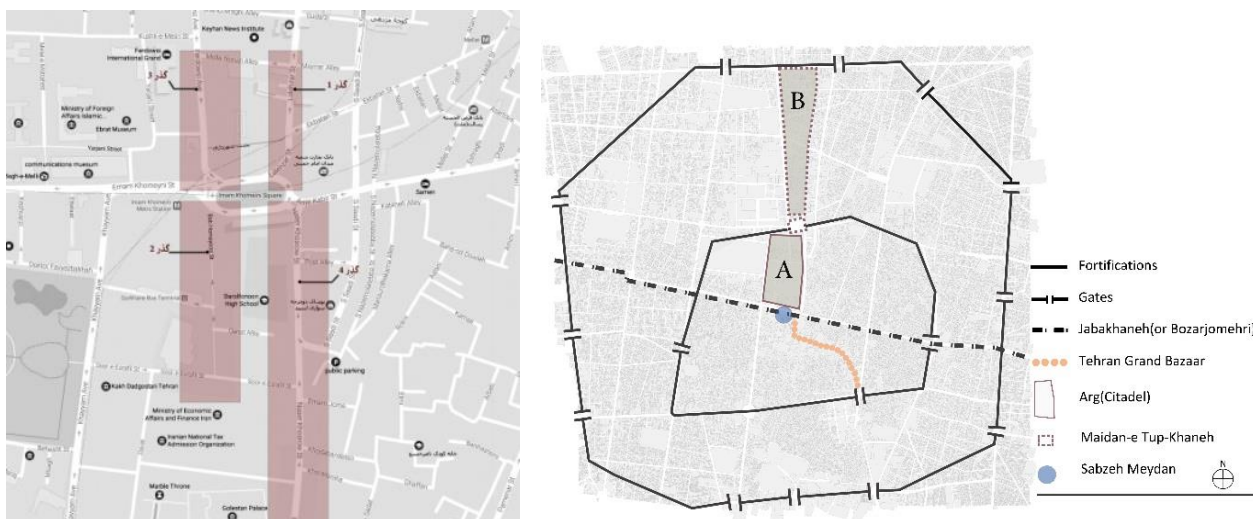


Diagram 1. Location of Imam Khomeini Square (Tup-khana), Four Studies Streets, and Tehran’s Fortifications (Source: Author, Redrawn by Mahsa Amini and Elham Shojaei)

Table 1. The Association of ‘Walkability’ and the ‘Sense of the Place’

Place Components	Dimensions	Walkability factors	References
Physical Body	Ecological	Presence of trees (vegetation, green space, parks, landscaping, planter strips) for pedestrians, delights and comforts of natural features for walking people, shade or sun in appropriate seasons, building orientation, animals and ecosystems, biodiversity, street cleanliness, light and illumination, weather, air quality, (micro) climate comfort for walking, wind tunnels and conditions, energy efficiency	Rogers (1997), Kapland (1996) Jencks et al. (1996), Bulvarz (1993), Barton et al (1994), Harg (1969), Espim (2000), Hough (1989), Steiner (1995), Bentley et al. (1990), Mostafavi (2010), DOE (1990)
	Spatial	(Residential) density, spatial territories, the sequence of spaces, hierarchies, nodes, (semi) public and (semi) private spaces, spatial permeability, human scales, presence and quality of footpaths, right of ways (for walk and driveways), spatial configuration, passage continuity and integration with other spaces (including parks, yards, plazas, and squares)	Calthorpe (1993), Gario (1991), Frey (1999), Lynch (1976), Hough (1990)
	Morphological	enclosure, compactness, intensification, orientation and proximity of buildings, mass and space, voids and solids, dimensions (standards, width to length of the way, size, human scale, slope and grading), openings, layout, connectivity, street pattern and block size, frequency and variety of buildings	Sitte (1889), Carrier (1979), Hillier (1996), Whitehand (1981), Alexander (1977, 1987), Rossi (1982)
	Contextual	Context, street furniture, street frontage (entrances and other sensations along street frontages), buildings and passage articulations, connections (with entrances and other sensations along street frontages, edges, districts, zones, alleys, architecture, passages, pedestrian and non-pedestrian anchor points), physical characteristics, passage covers, harmony with local methods, passage maintenance, sidewalk obstacles (permanent or temporary), passage efficiency for people with difficulties (child, elderly, physical disability), the oldness of bodies, transparency(including the amount of glass in windows and doors), transparency (including the amount of glass in windows and doors)	Verskel (1969), Tybaldz (1992), Sharp (1946), Niren (1955)

Place Components	Dimensions	Walkability factors	References
	Visual	aesthetics, visual and aesthetical design, landmarks, visual permeability, color, texture, materiality, utilities expose, exterior additions to the facades, visual qualities at night, different visual scales (small, medium, big), views (from and toward), visual corridors, visions for pedestrians and non-pedestrians, visual continuity, statues, frequency and variety of buildings, serial vision	Unwin (1909), Cullen (1961), Tagnat and Robinson (1987), Gybird (1953), Mozayani (1996), Moughtin (1995)
Image	Perceptual	Distinctiveness, identity, heritage, sense of place, character, nostalgia, collective memories, legibility, way-finding, meaning, national and public events	Lynch (1960), Bacon (1975), Nurberg Schultz (1980), Appleyard (1981), Jencks (1988), Nasar (1990), Altman, Wellville, and Hellville (1985, 1976), Moore et al. (1985), Strauss (1961)
	Social	Greetings, crimes, safety, security, comfort, social inclusion, vitality, public health, quality of life, car accident, different group interactions (children, strangers, etc.), genders, age, races, population density, car users, street performance, scents, noises	
Behavior	Functional	Movement, access (to (on-street) parking and all land uses), safe places for people to sit (like public use in open spaces), dining outside (alfresco dining), diversity, urban utilities, activity patterns (like sitting, standing, passing), (pedestrian) crossings, jaywalking, distance to the public transportation/transit, garage provision, pick-ups and drop-offs, traffic volume and speed, car types, number of pedestrians and riders, bike lanes, entertainment centers, human needs (considering minorities), watch over the streets from buildings	Jacobs (1961), Bentley et al. (1985), White (1980 and 1988), Newman (1972), Gole (1987), Saint (1970, 1972, 1977) DOE and a DOE T. (1992), Lang (1994, 1987, 1995), Cooper Marcus and Sarkisian (1986), Buchanan (1989), Rappaport (1977, 1982) (Gehl, 1971)
	Optional	presence pattern (dress, hairstyle), strolling, tanning, the pattern of movement, ambition, freedom of individuals or private actions, public participation, community engagements, diversity (for instance variety/plenty of places to go to near the majority of homes/buildings), personalization, cleanliness	

Resource: (Rezaei 2014, p 22)

B. Range of Projects for Pedestrians

After arriving automobiles in the 20th century, cities have developed based on the new street patterns such as *the linear city of Arturo Soria y Mata* (1892), *the industrial city of Tony Garnier* (1917), and *the Garden City of Ebenezer Howard* (1898). The existed centers also changed to adopt the car traffic. For example, Eugène Hénard introduced the 'roundabout' in Paris first in 1907. Every time the technology has moved on, the lifestyles, behavior patterns, and accordingly street prototypes have changed as well (Hall & Tewdwr-Jones, 2010; Gunnarsson, 2004).

Unpleasant urban consequences of the massive number of private cars including heavy traffic, transit problems, social segregation, suburban challenges, environmental pollutions, and unsafe neighborhoods

put forth ideas to support walkability and pedestrianization.

Mumford comments on new streets and the emergence of cars in urban areas:

Waterfronts might be made inaccessible to the stroller, ancient trees might be slaughtered and venerable buildings [were] torn down to speed traffic. This paved desert, adapted primarily to wheeled traffic, became also [the] park, promenade, and playground: a grim park, a dusty promenade, a dangerous playground (Wallar, 1988).

Jane Jacobs in her book *The Death and Life of Great American Cities* has expressed the significance of walkability by considering the sidewalk of the streets as a powerful place for the public even if it is not well designed (1961).

Several alternatives including sidewalks widening, utility upgrading, complete separated

pedestrian pathways, pedestrian zones¹, traffic calming and complete streets with all transportation modes have been proposed in favor of walkability and pedestrian priority.

One of the Radburn Design Principles² (1929), for instance, has been a complete separated pedestrian pathway from the automobiles so that people could live peacefully with the automobile or rather in spite of it. Incorporating the idea into several neighborhoods, all proposed single-family houses could face sidewalks and green spaces, backing onto short bays (loop streets) within a superblock (Schaffer, 1982; Hall & Tewdwr-Jones, 2010, p. 39).

Since 1940, the 'car-free' zones began to expand especially in Europe with three identified models: The Vauban model is the first model where the area is free of the car park and stop. In this model, there is not any physical barrier to stop cars from going into urban districts, so there will be some traffic calming solutions with low-speed regulations for cars. Vehicles are allowed to enter these streets at a walking pace to pick up and deliver but not to park. The second model offers limited access to cars with physical (removable) barriers. Removable bollards restrict access to the core of these sites. Thus, the traffic is not allowed for everyone, all the time and the transportation of special vehicles is possible sometimes. Normally a local residents' organization controls these bollards which are removed for a limited range of vehicles such as removal vans and emergency vehicles, but not for general deliveries. Pedestrianized city centers usually with substantial residential populations are the third model where a car never can and should not pass them³ (Melia, Parkhurst, & Barton, 2011).

Overall, some advantages of these models are as follows.

- Accommodating more people in traffic rush hours, with a lower cost in comparison with the other transportation modes,
- Pedestrians are able to use urban spaces more efficiently than car occupants,
- Reducing air pollution and CO₂ emission,
- Reducing noise pollution, especially in cities,
- Increasing social interaction,
- for most people walking is the best overall physical activity for maintaining and improving fitness and health, and

- Reducing road traffic injury and providing safer and more favorable places for children and people with special needs (Tolley, 2003, pp. 11-12; Melia, Parkhurst, & Barton, 2011, p. 28; Scheurer, 2001; Nobis, 2003; Ornetzeder, Hertwich, Hubacek, Korytarova, & Haas, 2008).

These three models are also known as 'car-free' developments for residential or mixed-use areas. Those developments normally provide a traffic-free immediate environment and offer no parking or limited parking separated from the residence to enable residents to live without owning a car. Therefore, the fundamental challenge in these areas is parking and vehicular access. The study by Borgers (2008) in the Netherlands shows that car owners in these sectors complain more about their living places being kept away from their vehicle parking (Melia, et al., 2011, pp. 31-34). However, similar attempts such as seasonally or temporarily closing the roads to the cars and sharing open spaces of the communities, housing, educational or any type of campuses within the cities for children or public groups improved since 1960. The new environmentally friendly towns, low energy, and carbon-neutral developments built from recycled materials are intended to be largely car-free, with pedestrian and cycle-friendly environments (Hall & Tewdwr-Jones, 2010, p. 162).

4. DISCUSSION

The correlation between 'walkability' and 'the sense of a place' in this research was established based on the factors these two variables share in common according to the extensive literature review (Table 1). Moreover, the most relevant factors for selected areas were chosen as the result of a series of rigorous site observations and eventually panel confirmation. Table 2 shows the 23 selected factors. It then structured a questionnaire to measure the variables.

The measurement of this research confirmed that amongst the four studied streets, 'the sense of the place' for Bab-e-Homayoun was the most whereas for Lalehzar was the least. Naser Khosrow and then Ferdousi's sense of the place falls in between (Table 3). Even though Bab-e-Homayoun, which has been operating as a pedestrianized street, received rather a moderate score in all physical, perceptual, and behavioral aspects, its scores were the highest amongst all studied streets. It also revealed that in this pedestrianized path, the place aspects were more balanced because the differences between all its scores were the least (Chart 2).

¹ Also known as auto-free zones, car-free zones, pedestrian precinct.

² by Clarence Stein and Henry Wright

³ Some of the restricted areas allow bicycles and carriages to pass through.

The expert panel in this research believed that the walkability should be improved in all streets with giving high priority to Lalehzar. Naser-khosrow and Ferdowsi were considered for the second and the third priorities in this regard (Chart 1). Considering

the overall quality ranking of these streets, according to the experts, Lalehzar Street had the lowest quality, which was less balanced with the highest demand for implementing walkability plans (Chart 2).

Table 2. Selected Factors for the Research

Components of the Sense of the Place	Aspects	No	Selected walkability factors
Physical	Ecological	1	Articulation of natural landscapes and the passage
		2	Level of Climatic comfort for walking
	Spatial-Morphological	3	Human scales (dimensions, slope, and grading, etc.)
		4	connections
	Contextual	5, 6	The quality of surfaces (Historic/New)
		7	passage efficiency for people with difficulties (child, elderly, physical disability)
		8	Variety and visual permeability
	Visual	9	Serial vision and visual continuity
		10	visual qualities at night
		11	Exterior additions to the façade
		12	Identity, meaning, heritage, and nostalgia
13		Legibility and way finding	
Perceptual	Social	14	National public events
		15	Social inclusion
		16	Safety
		17	Greetings and social interactions
Behavioral	Functional	18	Land-use Diversity
		19	Dining outside
		20	Access
	Optional	21	Traffic speed
		22	Freedom of individual actions
		23	Cleanliness

Table 3. Measurement of the sense of the place for the selected areas

Overall Ranking	Streets	Sense of the place (Scores out of 5)	Quality				
			Very Strong	Strong	moderate	Weak	Very Weak
First	Bab-e-Homayoun	3.06			<input checked="" type="checkbox"/>		
Second	Naser-Khosro	2.86				<input checked="" type="checkbox"/>	
Third	Ferdowsi	2.51				<input checked="" type="checkbox"/>	
Fourth	Lalehzar	2.24				<input checked="" type="checkbox"/>	

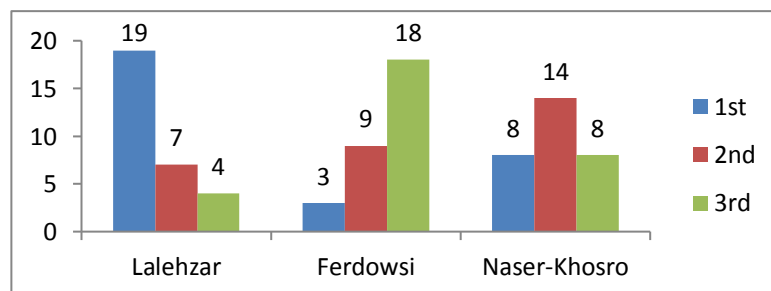


Chart 1. The Priority for Improving Walkability Agreed by the Panel

Chart 2 also indicates that the behavioral aspects of all streets were the most problematic. The improvements in this aspect, including social, functional, and optional dimensions will have the most influence to balance the place quality. On the one hand, optional behaviors such as strolling, the pattern of movement, ambition, and cleanliness had the highest quality in pedestrianized Bab-e-Homayoun (Chart 3). It means pedestrianization may let people feel more freedom in the city at least in terms of movement maneuvers. On the other hand, factors including safety, access, and land-use

diversity, for example, have been among the challenges for the users in this street. It indicates that although pedestrianization increases walkability and the sense of the place, it still requires complete attention to the whole walkability improvement factors in all the surroundings. Therefore, the place sense will definitely advance if walkability increases for instance with sorts of pedestrianization projects.

Based on the highest priority to enhance Lalehzar Street, people were asked about a series of alternatives for this street.

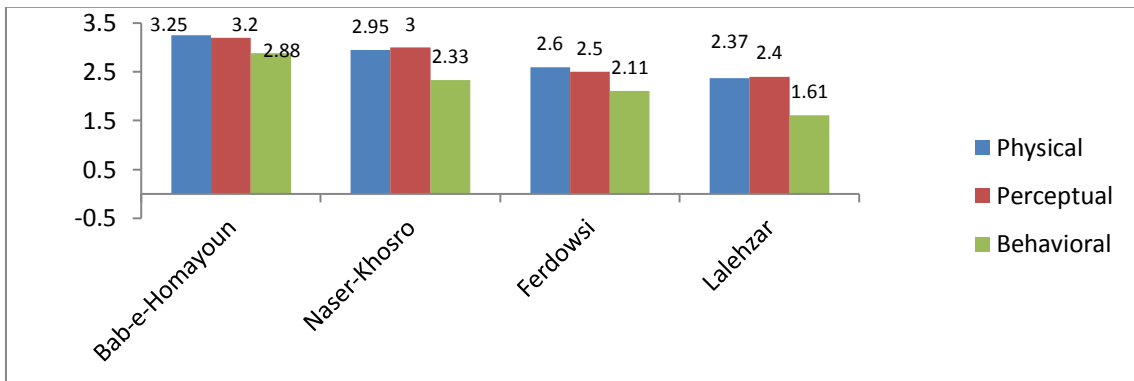


Chart 2. Comparison of Physical, Perceptual, and Behavioral Aspects in the Studied Streets

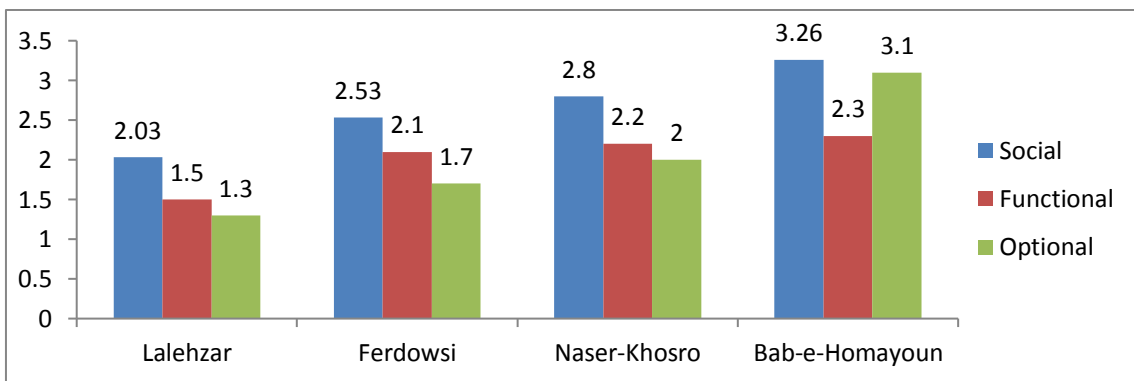


Chart 3. Behavioral Aspects including Social, Functional, and Optional Dimensions in the Studied Areas

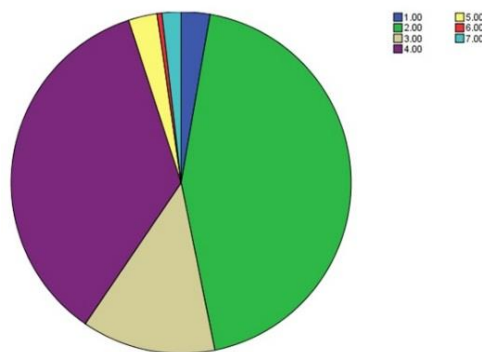


Chart 4. Participants' Reasons for Refereeing to Lalehzar

From the highest to the lowest: 1) retailers (44.3%), 2) shoppers (36.2%), 3) passers for transition (12.2%), 4) residents (2.3%), 5) strollers for leisure (2.7%), 6) others (1.8%), 7) visitors (for sight-seeing /tourists are included) (0.5%)

The majority of participants agreed that this street needs serious care. They denied the idea of converting the street into a toll road (chargeable traffic road). People also preferred at least Vauban or complete street models in which pedestrians and public transportation could have priority access (Chart 4).

Widening the sidewalk, allocated parking, pedestrianization, utility upgrading, renovating the distinct cultural character of the street (cinemas, theatres, museums, coffee shops, etc.), monitoring motorcycles and improving tourist attractions were among the solutions that people voiced. On the contrary, they mentioned the most challenges for the street. Table four has categorized the relevant problems.

All in all, walkability must increase in Imam Khomeini Square (Tup-Khana Square), particularly in Lalehzar Street at least to change it to a model of a complete street, Vauban, or limited access to private cars. Walkability should expand from Bab-e-Houmayoun and Lalehzar to all the side streets and the whole of the historic neighborhoods. It may similarly extend to the first and second city fortifications in order to prioritize pedestrians, cyclists, and public transportation within Tehran's historic zone. City blocks within or outside the historic boundary may also develop in a way to respect walkability, integrate pedestrians, and green networks.

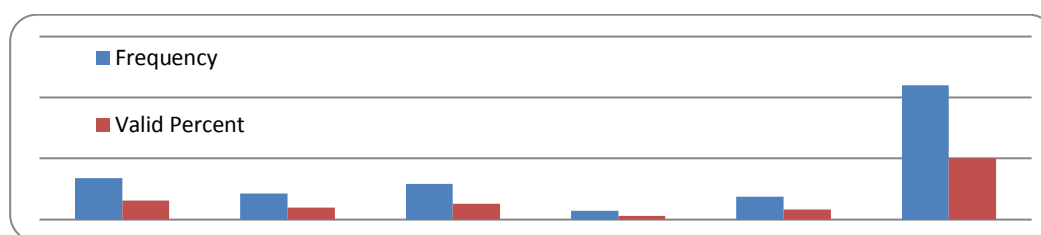


Chart 5. Frequency and Percentage of the Five Proposed Traffic Modes for Lalehzar Street (based on People's Preferences)

Pedestrianized alternatives (car-free zone options): 1= Closed to all vehicles, 2= Closed to private vehicles (for pedestrians, cyclists and public transportation), 3= Car-free for certain periods, 4= toll road (controlled or monitored road), 5= Complete Street (traffic calming)

Table 4. Frequency of Problems in Lalehzar Street (based on People Comments)

Frequency	Components	Problems
61		lack of parking areas
27	Behavioral	overcrowded
13		overrepresented motorcycles traffic
5		transport cargo
5	Physical	urban furniture
4		narrow or limited passage
2	Behavioral	pollution and dirtiness
2	Physical	dilapidation of buildings
1	Behavioral	One-way traffic (single way direction)

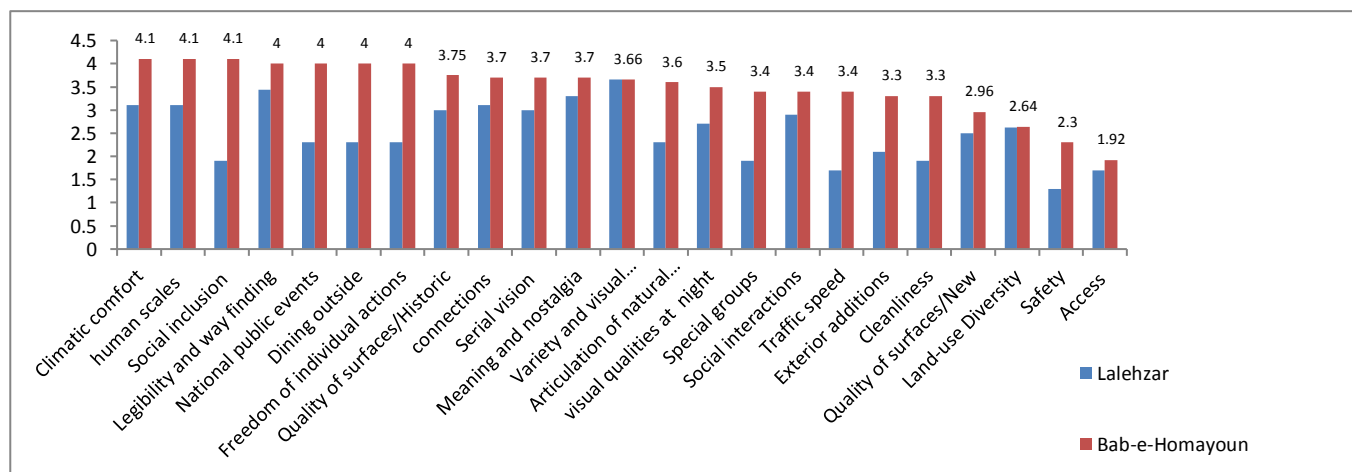


Chart 6. Comparing all Studied Factors in the Most (Pedestrianized Bab-e-Homayoun) and the Least (Lalehzar) Walkable Streets (Sorted from the Highest to the Lowest Measure for Bab-e-Homayoun Street)

In order to expand the walkability in the studied area, some recommended strategies were categorized based on the interviews, surveys, consensus, and the blocks connection policy. For block B (Diagram 2), Lalehzar should work as a complete street. There is no need to close it to the cars at all. Instead, the whole block (B) should be surveyed for a car-free zone proposal. The areas between Ferdowsi and Lalehzar have the potential to be more open to the public. It may work as a garden for national and international cultural uses. Even electric shops may facilitate gentrifying the area into a media village or Internet district. By encouraging the artists to sponsor the city hall, for the benefit of all citizens, it is also possible to witness a creative cultural town in this block¹ in a participatory manner.

Block A, the Golestan Palace (Fig. 7), which works as a museum, might be open to the public for specific periods. Pedestrianized Bab-e-Homayoun might then be connected to the whole area and block A would be strongly related to Panzadeh Khordad (formerly known as Jabakhaneh or Bozarjomehri) Axis as well as the Grand Bazaar. In this case, as seen in Diagram 1, Jabakhaneh Street could represent the X-axis of Tehran where Sabze Meydan represents the Zero number and Block A and B represent Y-axes of Tehran with the hope of expanding walkability more and more based on the historical structure. Obviously, this new pedestrian network must be in strong connection with the metro and other transportation modes at Tehran downtown.

5. CONCLUSION

The rich historical Tehran downtown configuration, including heritage areas within three fortified zones located at the heart of the city, might be connected through a walkability expansion network.

Some pedestrianized projects in Tehran have been more successful but the absolute restricted street axes toward automobiles should not be considered as the only one model. On the contrary, it might work with various alternatives respecting walkability through districts and zones development with programs, plans, as well as designs based on Tehran's historical structure. For example, Bab-e-Homayoun, Naser-Khosrow, and Jabakhaneh pedestrianization axes may expand through the whole surrounding zone (A) as a pilot project. In addition, the Arg section or Golestan Palace has the potential to be open to the

public in some specific periods based on a city 'program' rather than any predominant urban 'project' or 'design'. The walkability may expand from this zone toward both other historical fortifications: Tahmasp (which includes Block A) as well as Safavid (including Block B). Similar pilot proposals may expand the walkability within the whole fortifications.

However, Tup-Khana Square works as a crucial urban space where the connection between all three zones in the fortifications happens at the same time. Sabz-e-Meydan similarly represents another city anchor point by connecting the Arg with Great Bazaar. The whole structure (as shown in Diagram 1) prepares an available structure for expanding the downtown walkability.

Improving walkability will not only give priority to pedestrians to live, shop, entertain, enjoy, and spend their time more efficiently in the cities but also balance the various physical and non-physical aspects of the built environments. It must potentially speak for the original Tehran structure too. The 'sense of the place', therefore, will enhance through the 'walkability' improvement. It may take back the physical, perceptual, and behavioral characters of a neglected historic area. But it must not be limited to only a single segment of the street or only one model of pedestrianization. Nevertheless, it must be integrated with the total city's development plans.

In addition to the other technical urban studies, assessing and improving walkability with people and experts' opinions would provide a model to support decision-makers to prioritize strategies for improving urban spaces. However, plans or decisions on walkability should cover a series of alternatives, not only traffic engineering set of policies but also policies in favor of people. It includes congestion charges or restricted driving zones, sidewalk widening, maiden improvement, seasonal or temporary closing to car traffic, pedestrianization, laying out the limited access, and Vauban models. Furthermore, these policies should be applied to as many urban projects as possible. For example, in addition to the city's historic areas, it is also possible for mixed-use zones, residential areas, institutional campuses (colleges, universities, hospitals, etc.), and all city blocks to share their outdoor spaces with more pedestrians and fewer private car traffics.

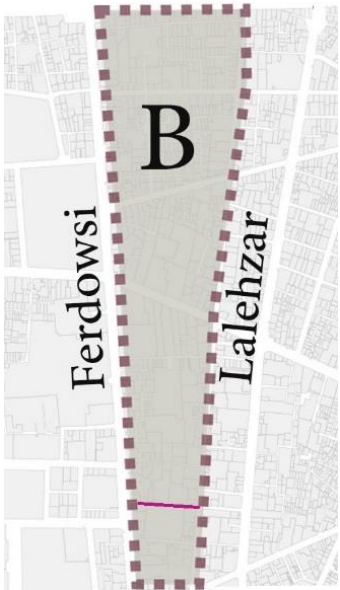
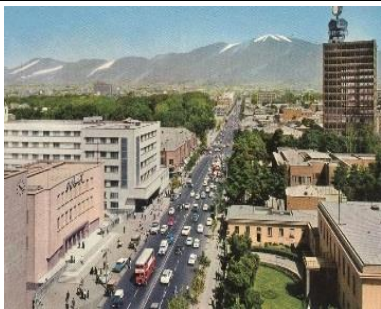

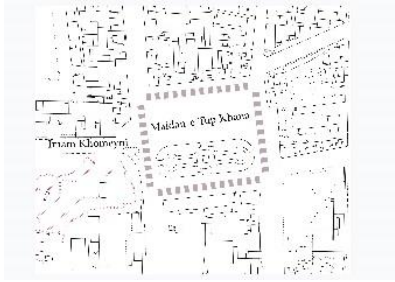

People participation as well as experts' engagement, however, should be accounted for in all urban planning decision processes. It may happen through a series of public meetings, walking tours, and events, leading with city councilors, where communities should have the chance to have major input in walkability decisions.

¹ Under the ground, beneath the block, it is possible to propose spaces for parking, utilities and warehouse for the shops and Bazaar

In the case of Tehran, the characteristic of high historic streets downtown including streets leading to the Imam Khomeini square (Maidan-e Tup-khana) can be re-imagined by implementing, measuring, and improving walkability. This may expand level by level from the square and its leading streets to the first and second city fortifications and far more beyond the historic zone to integrate and link the whole city's street and green networks.

With this ambition in mind, each existing or future city block could turn into a more walkable and green area by applying common ideas in traditional Tehran such as 'introvert' architecture, central 'courtyards', 'Persian Gardens', and 'tree-lined' streets. It may produce the mix of all various alternatives of 'car-free' zones and micromobility devices to maximize the capabilities of walking, biking, and cycling for all diverse groups of people within the Tehran downtown.

Table 5. General Recommendations for Walkability Expansion through the Surveyed Areas

Streets (Original Names) Recommendations on Walkability Expansion	Figures and Location Diagrams
<p data-bbox="121 936 185 1160" style="writing-mode: vertical-rl; transform: rotate(180deg);">Block B (North to the square)</p> <ul style="list-style-type: none"> <li data-bbox="229 831 497 920">• Lalehzar Ferdowsi (Ala-odoleh or Aminolsoltan) <p data-bbox="229 1151 568 1301">Main Streets might change into Complete Streets whereas internal areas in zone B may convert into a pedestrian-only development.</p>	<div style="display: flex; justify-content: space-around;"> <div data-bbox="619 725 959 1312">  <p data-bbox="619 1323 1046 1384">Diagram 2. Block B includes Ferdowsi St. and Lalehzar St.</p> </div> <div data-bbox="1075 696 1457 1003">  <p data-bbox="1075 1014 1414 1043">Fig 2. Ferdowsi St. (the 1960s)</p> </div> <div data-bbox="1075 1055 1457 1361">  <p data-bbox="1075 1373 1394 1402">Fig 3. Lalezar St. (the 2010s)</p> </div> </div>
<p data-bbox="121 1451 185 1709" style="writing-mode: vertical-rl; transform: rotate(180deg);">Imam Khomeini Square (Maidan-e Tup-khana)</p> <p data-bbox="229 1406 587 1469">Imam Khomeini Street (Sepah or Bagh-e-Shah or Marizkhaneh)</p> <p data-bbox="229 1541 587 1697">Urban retrofitting is highly recommended and there is no restriction against traffics but pedestrian movements should be highlighted.</p>	<div style="display: flex; justify-content: space-around;"> <div data-bbox="619 1406 1015 1686">  <p data-bbox="619 1697 919 1753">Diagram 3. Tup-Khana Sq. (See Fig 1 and Diagram 1)</p> </div> <div data-bbox="1075 1406 1457 1709">  <p data-bbox="1075 1720 1449 1749">Fig 4. Tup-khaneh Sq. (the 1940s)</p> </div> </div>

Streets (Original Names)
 Recommendations on
 Walkability Expansion

Figures and Location Diagrams

Block A
 (South to the square)

- Bab-e-Homayoun (Almasiyeh)
- Naser-Khosro (Naseriyeh)
- Panzdahe-Khordad (Jabakhaneh or Bozarjomehri)
- Khayam (Jalil Abad or

Bab-e-Homayoun pedestrianization may expand through the whole zone A. Similarly, Golestan Palace might sometimes be open to the public. Therefore, Zone A may develop as a car-free zone. The walkability may expand from this Zone toward both historical fortifications: Tahmasp's which includes Block A as well as Safavid's including Block B.

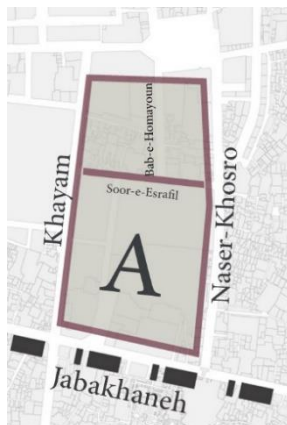


Diagram 4. Block A includes Khayam St. and Naser-Khosro St.



Fig 5. Bab-e-Homayoun St.



Fig 6. Shams-al-Emara Tower at Naser-Khosro St.



Fig 7. Golestan Palace in Block A

Illustration Sources (Table 5): Photos shown as figures 3, 5, and 6 taken by Ayda Irani Molk Kian; Figures 2-7 gathered by Elham Shojaei, and Rojin Marzi; Diagrams prepared by Elham Shojaei

5. ACKNOWLEDGMENT

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