Original Research Article

Examining the System Governing the Passages in the Historical City of Qazvin*

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Abstract | Historical cities are living evidence of human civilization and culture. However, there is still much work to be done to identify and accurately understand such civilizational layers in Middle Eastern historical cities. One of the ambiguities associated with Islamic cities is the researchers' emphasis on their unsystematic arrangement, to the point where some researchers have suggested that the lack of arrangement in the historical network of streets is proof of its chaos. Some scholars, on the other hand, have denied such disorganization and provided answers to prove that an arrangement exists in historical passages. However, the significance of passages in the historical city has yet to be completely examined and described. This study is an attempt to scrutinize the role of the passages in the historical city of Qazvin using a descriptive-analytical method. In addition, morphology and GIS tools were used to identify and analyze the characteristics of the passages in the historical neighborhoods of the Qazvin. The findings of the study show that the passages of the ancient city have been systematically developed and include perceptual, social, and economic components.

Introduction| Urban interconnected systems are classified into four groups based on their mode of transportation: radial systems, grid systems, ring systems, and organic systems. An organic (disturbed) system is referred to as a system whose designs and structures have not been developed based on human thoughts; the city has been formed by chance, and its highways, streets, and small alleys are intertwined with twists and turns. The textures of Shushtar, Rasht, and Lar, as well as some of the historical textures of various Iranian cities, are featured in an organic system (Farid, 2011). However, the old networks of Iran cannot be called chaotic because these cities have been formed and developed based on time, place, culture, geography, and other factors. The communication spaces of the old pedestrian texture could keep passersby away from the sun and scorching heat of summer, gusts of cold wind, and harsh winter weather and reduce the severity of their effects. The width of the network paths was proportional to their position in the hierarchy of the interconnected network (Soltanzadeh, 1988, 313). Orientalists have frequently highlighted the lack of organization in Islamic cities and the existence of narrow and nested streets and alleys, as well as the apparent lack of arrangement in the bodies of cities, as examples of disorder (Bayat, 2014, 151). Djait, in his book Kufa, the Birth of the Islamic City, argued that what was introduced by orientalists as the transformation of disarrangement in Islamic cities was a kind of arrangement but not of a clear geometric type. In his view, Islamic civilization has given a special look to the city. This civilization, through which the city has "made itself", highlights the twisty structures, the superiority of the covered zones, enclosed and covered houses, the specialization of public places, their placement in the center, and their extension to other neighborhoods (Djait, 1993, 164). The historical cities of Iran have a systematic texture and are based on inherent social order. Some Iranian researchers, such as Gharib and Farid, and foreign researchers, such as Duplanol, Brunschwig, and Worth, have found the streets messy, disordered, and shaped by themselves. It seems that the formal comparison of the nested and twisty streets of dense Islamic cities with the open and straight streets of Greek and medieval cities, as well as the lack of attention to the internal arrangement of the

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streets of Islamic cities, play a significant role in the view of the disarrangement. The result of the above-mentioned incorrect reading has led to inappropriate planning in the zones of historical cities and caused serious damage to historical contexts. For that reason, understanding the dimensions and values of historical transitions to organize and improve the ever-increasing changes is an inevitable necessity. Therefore, the present research attempts to identify the characteristics of the passages in historical cities and examine their dimensions. The main concern of the research is to answer the following questions: What are the dimensions of historical urban passages? Does a system govern the historical passages in the study sample?

Literature Review

Given the important role of passages in the organization of Iranian and Islamic cities, several studies have been conducted on this issue. In the first volume of the book "Principles and Methods of Urban Design and Residential Spaces", Tavasli, one of the pioneers of accessibility, addressed the issue of design in Iranian cities, focusing on designs in the inner (historical), middle (contemporary), and outer (new) zones, and proposed an expansion design. He introduced the principles of organizing urban spaces based on the principles of connection, enclosing space, scale and proportion, contrasting spaces, territory, and composition. He especially discussed "accessibility design" in the second volume of the above-mentioned book. He used geometrical and drawing principles of urban design to propose expansions. For this purpose, he made modifications to Western and mainly European sources. His proposed rules and regulations for access were based on international and domestic experiences. He expressed several principles, including spatial continuity in the physical organization of the old cities of Iran, the renewal of the spatial organization, the connection between spaces, and the importance of scale and proportionality of access with the composition of the old spaces (Tavassoli, 1997, 66–67). He also highlighted the necessity of conducting the qualitative and spatial aspects of access with regard to the conditions of Iranian cities (ibid., 5). The organization in the passages of historical textures, which is the focus of this research, has been approached differently by researchers. Available different research methods include interconnected networks in the structure of neighborhoods based on descriptive-analytical, quantitative, and spatial research syntax; the morphological structure of urban historical passages based on the descriptive-analytical, documentary-survey method; the association between the urban morphological structure and social issues based on quantitative and qualitative or the method of analysis of morphological types; the methodological investigation of the issue of historical context; and finally, the pathological and comparative views based on quantitative, descriptive, or comparative method (Habibi, 2003, 37; Abedini, 2019;

Shojaei, Alemi, & Jayhani, 2021, 136; Paknezhad & Latifi, 2017, 51–52; Nikpour, Lotfi & Rezazadeh, 2017, 85; Kazemi, 2015; Moosavi, Habib & Majedi, 2017, 19; Farsi, Shahivandi & Nasekhian, 2020; Asadi & Pakzad, 2017, 1; Tavassoli, 1997; Hosseini & Soltani, 2018, 15; Gharavi Khansari, 2018, 61; Eslami & Aminzadeh, 2013, 33; Zhang, Zhang, Yu & Zhou, 2018; Summer, 2019; Sholeh & Yousefi Mashhour, 2019, 83, 104; Esfanjary, 2015, 57; Bonine, 1979; Zumelzu & Barrientos-Trinanes, 2019; 897, Liang & Cavaglion, 2022; Gaube, 1979; Yavuz Kumlu, Tüdes & Keles, 2018, 328) (Table 1). Despite growing studies on accessibility to historical textures based on interpretative-historical, descriptive-analytical, quantitative, and qualitative research methods or morphological types, studies on the organization or system governing passages in historical textures have been few.

Research Method

This is a review study employing the descriptive-analytical method. The quantitative method was used to identify and analyze the study sample. Based on library sources, the theoretical foundations were scrutinized to discover the dimensions of their system, identify, and analyze the study sample. The field study included the identification and analysis of the characteristics of the passages in the three historical neighborhoods of the study samples using GIS software. From the data from the study sample, three neighborhoods were compared. To address the concern about the comparability of data that might have been caused by the difference in location, the researchers selected three adjacent neighborhoods in the same city, Qazvin.

Theoretical Foundations

This part of the research first provides an overview of the concepts and definitions of the access system, and then by addressing the characteristics of the passages in historical cities, especially in the historical neighborhoods, the study seeks different urban aspects in the access system of historical contexts. Nizam comes from the word "nizam," which means arranging, decorating, stringing pearls, procedures, habits, and methods (Amid, 2009). The word "system" in the English dictionary is defined as "an orderly set of interconnected elements that interact with one another to accomplish a common goal. The word "system," which is translated as a system, refers to a set of related units or elements that work in communication and interaction with each other to achieve predetermined goals (Tavakoli, 2004, 48). System means "a set of elements with action and reaction", "a set of goals with relationships between goals and their properties," and "any set of elements that can interact with each other in some way can be viewed as a system" (Alem, 2013). The meanings of the word "access" in the Amid Dictionary are as follows: 1. the power; ability; the power to achieve something 2. Wealth. There are different definitions for access or accessibility, such

Table 1. Studying the system and structure of localities in previous researches. Source: Authors.

Approach	Methodology	Literature review on	Researcher
The structure of the communication network in the ossification of localities	It was used to organize the structure of the neighborhood based on the principles of urban design using the descriptive-interpretive method.	Planning the possibility of modeling and organizing the neighborhood through the identification of the ossifying factors of the neighborhood and the creation of new spaces at its edges	Habibi (2003, 37)
	It dealt with visual inspection and qualitative assessment of the spatial composition of streets and their interactions using the space syntax approach.	Pointing to the importance and stability of the structure of the main streets over time and maintaining their function to create vitality.	Zhang, Zhang, Yu & Zhou (2018)
	The analytical-descriptive method was combined with library study and review.	Highlighting the necessity of studying the pattern of the organic network of neighborhood centers in traditional neighborhoods.	Abedini (2019)
	The historical-descriptive method was used for pathology and the protection framework.	Paying attention to the passage and alley as one of the important characters of the historical city.	Shojaei, Alemi, & Jayhani (2021, 136)
	Using a qualitative method and with the help of historical descriptions, it dealt with the importance of the role of changes and developments of alleys in urban development policies and approaches.	Highlighting the importance and role of streets in urban development and emphasizing the necessity of understanding their developments in the past for a critical evaluation of today's developments.	Summer (2019)
Morphological structure of neighborhoods	The type of research in this article was descriptive-analytical and comparative. Library studies were conducted and the theoretical framework was explained. Aerial photos were verified with GIS software and analyzed with Depthmap software.	Identifying the grid and regular structure, with the greater dispersion of uses and activities at the neighborhood level, and the organic structure with the accumulation of activities serving as the basis for the formation of diverse behavioral patterns due to physical limitations.	Paknezhad & Latifi (2018, 51–52)
	Descriptive-analytical and documental-survey methods were used, and documentary analysis and library study methods were carried out to collect the existing views, theories, and experiences.	Pointing to the direct and meaningful relationship between the compressed form and access and that compression has a direct effect on increasing the number of accesses.	Nikpour, Lotfi & Rezazadeh (2017, 85)
	Historical-interpretive methods and logical reasoning were used, and data were collected in the form of documents and fieldwork.	Pointing to the necessity of a typological view and the necessity of physical and content classification in historical contexts for conscious and homogeneous intervention.	Sholeh & Yousefi Mashhour (2019,83,104)
	The descriptive-analytical method was used and the morphology of Meybod city as a case study was examined from ancient times to the 15th century.	Dividing the network of streets in historical context into different types such as winding patterns (organic), orthogonal patterns (linear), and geometric systems and providing explanations about the logic of the formation of each of them.	Esfanjary (2015, 57)
	It seems that the descriptive-analytical method along with field studies and documentation was mainly used.	The basic morphology of traditional Iranian cities is based on the irrigation network and building houses in rectangular fields and gardens.	Bonine (1979)
The association between the morphological structure and social issues	Quantitative and qualitative methods were used to investigate the effect of urban form on neighborhood vivacity.	Using quantitative and qualitative methods, it explores the morphological elements that affect the vitality of human activities.	Zumelzu & Barrientos-Trinanes (2019,897)
	A mixed method was used to analysis of morphological types and display of cultural images (sense of place) - the impact of cultural changes on urban identity and residents' perception is investigated.	Presenting a cultural look at the street in two scales: the neighborhood and block scale as a spatial continuum, and the building scale as a social catalyst.	Liang & Cavaglion (2022)
Methodology	Methods of reading historical meanings include: 1- Knowing the characteristics of space, 2-Knowing the relationship between context and time, 3- Recognition of changes in the expression system	Providing a methodological study on the recognition and reinterpretation of environmental meanings, especially in historical contexts.	Kazemi (2015)

Rest of Table .

Approach	Methodology	Literature review on	Researcher
Building Pathology	An analytical-descriptive method and a documentary method were used to collect information.	Investigating the lack of accurate understanding of the nature of the old context of the historical city to adapt to contemporary conditions.	Moosavi, Habib & Majedi (2017, 19)
	This study employed a mixed method (qualitative-quantitative) and a comparative and analogical analysis using futurology modeling.	Pointing to the lack of a plan and conservation attitude in the organization of historical passages.	Farsi, Shahivandi & Nasekhian, 2020; Asadi & Pakzad (2017, 1)
	The research method was descriptive-analytical and the required data was gathered through library and field methods.	Mentioning the inefficiency of the communication network—narrow, intertwined, non-geometric, and inconsistent with access needs—is the most important problem of the old fabric of the city.	Asadi & Pakzad (2017, 1)
	The study employed interpretative analysis along with changes from Western and mainly European sources.	Examining the weakness of vehicle access, the main physical problem of Iran's old cities - access design in residential and old zones- review of international and domestic experiences.	Tavassoli (1997)
Comparative approach	It was descriptive-analytical. In the analytical part, a comparison was made between the traditional neighborhood and the new residential zones.	Presenting the advantage of the gradual formation of old neighborhoods and the lack of definite success in contemporary pre-designed patterns.	Hosseini & Soltani (2018, 15)
	It was descriptive-analytical. In the analytical part, a comparison has been made between the traditional neighborhood and the new residential zones.	Highlighting the importance of the two stages of "recognition" and "identification" in the process of perceiving identity and comparing contemporary and old neighborhoods.	Gharavi Khansari (2018)
	The research method was comparative. Based on the analysis of neighborhoods and neighborhood units, the study examined the two principles of centrality and territory by using two case studies.	Recognizing the neighborhood in Iranian urbanization as a social territory for residence and the western neighborhood unit as a physical territory for some social concepts.	Eslami & Aminzadeh (2013, 33)
	It seems to have been done with a historical-interpretive method with library studies, archaeological evidence, and related documents.	Comparing pre-Islamic Sassanid cities and post-Islamic cities: the expansion of cities with the creation of mosques and markets in the development of neighborhoods after Islam.	Gaube (1979)
	A quantitative method and numerical analysis at the scale of the neighborhood unit were used to examine the impact of factors such as land use diversity, density status, and the degree of realization of design criteria on economic, environmental, and social sustainability.	Proposing a neighborhood unit scale method for numerical analysis of the built environment and investigating the relationship between planning decisions and economic, environmental, and social sustainability.	Yavuz Kumlu, Tüdes, Keles (2018,328)

as interconnected network and urban service access network (Gharib, 2006, 14), the potential of interaction opportunities (Hansen, 1959), the ease of access to any land use from a place using a system of specific transportation (Dalvi & Martin, 1976), the freedom of individuals to decide whether or not to participate in various activities (Burns, 1979), and the benefits of the transportation/land use system (Ben-Akiva & Lerman, 1979), something providing individuals or groups of individuals with opportunities to participate in activities in different locations (Karst & Bert, 2004), the ease of visiting destinations for residents to meet their needs (Krizek, 2010), accessibility, and the overall ability of individuals to access the desired goods, services, activities, and city points (Seifoddini & Shoorcheh, 2014, 484). Access refers to people's overall ability to access desired services and activities, as well as the time and cost allocated to transportation by people and businesses (Litman, 2012).

Based on the above definitions, the access system can be considered a set of continuous components or elements that work for people to access services, goods, desired activities, or urban points. In other words, the access system is an ordered set of interrelated units or elements that interact to fulfill people's needs. Although the access system is mostly established in the context of the roads, its role goes beyond moving people from one point to another or proposing to shorten the route or travel time of people. The access system

has a special place in the city, and to understand it, the dimensions of the access system in its interaction with the city should be clarified. For this purpose, the dimensions of the access system have been explored by focusing on the recognition of historical neighborhoods as orderly, small urban complexes. One of the important features of the old textures of Iranian cities is their division into some neighborhoods because each historical city as a whole has been composed of parts in the form of neighborhoods (Moosavi, Habib & Majedi, 2017, 23). Moreover, the cities of the Islamic era have a special organization that is based on the equality of citizens, promoting the possibility of their equal access to city services. For this season, the spatial organization in the cities of this era is based on the definition of the public service center, sub-systems, including semi-independent neighborhoods and service complexes, and interconnected structures (Molaei, 2017, 860). Several theories refer to the importance of roads. For example, in his theory of urban morphology, Kanzen introduced land use, the structure of buildings, the pattern of parts, and street patterns as the main elements of urban morphology, among which the pattern of the street network was one of the most important and lasting elements (Paknezhad & Latifi, 2017, 35–36). This element has also been considered the most important one in citizens' perceptions of the city (Atashinbar, 2012, 2). The perceptions of the citizens are shaped by the streets and alleys, and the city buildings are the next important factor contributing to the perceptions. The empty spaces of city streets are the ones that mainly define the perceptual boundary of the physical and full city spaces. Although urban buildings have been renewed over time, urban streets are permanent regardless of their changes in the historical city; thus, a large part of the citizens' historical memory as well as their perceptions of the city have been created through the access system. The neighborhood system and structure of the city in Islamic countries have been influenced more by the territorial characteristics and a set of pre-Islamic social and cultural conditions and factors than by the Islamic worldview, teachings, and rulings (Sheikhi, 2003, 65). In larger neighborhoods, by creating a main center at the neighborhood level and a network of sub-centers that are reminiscent of the main center, it is possible to expand the interactive movement and connect forces in the main center to the entire neighborhood. In this way, the residents of their neighborhood contribute to the organization created by the local structure (Abedini, 2019). In these neighborhoods, the primary nucleus from which the main passages run and the roads that are about to develop in the neighborhood are clearly defined, and along with the growth of the neighborhood, the passages develop and reflect all the normative and behavioral currents of the neighborhood, including the spatial organization and the arrangement of the infrastructure of the neighborhood (Habibi, 2003, 34). Urban neighborhoods provide the possibility for different strata, groups, sects, and

religions to recover their identities in the "intimate" zones and rebuild their customs, habits, and ceremonies within the framework of the city (Sheikhi, 2003, 40). Since the design of the passages in these zones is based on the pattern of privacy, in the twisty pattern, the spatial hierarchy of public, semi-public, semi-private, and private zones is maintained even if the width of the passage changes. In this way, in addition to creating cohesion in the dense texture of the city, a coherent social network should be woven (Sholeh & Yousefi Mashhour, 2019, 86). The interconnected structure is formed organically within the limits of the old urban texture, considering the human scale. Among the prominent features in the structure of the communication network of old neighborhoods are short accesses on a pedestrian scale with a prominent social role, the complexity of streets, which is influenced by weather conditions, and urban security (Esmailian & Pourjafar, 2013, 71). Social communication among citizens is formed on urban streets, where public space and gatherings of the city are created. Urban streets are always the place where the social roles of citizens are represented. Therefore, the social dimension is one of the most important pillars of urbanism and plays a key role in the access system in historical cities. The types of roads can be functionally classified into two groups: First, the roads that run through the neighborhoods, some spaces, and architectural and urban buildings. Those ways that serve as transits and enable access to other buildings are called streets. However, in different regions and cities, they are called by different names and terms, such as Kooy, Kuche, Raste, Gozar, etc. The second group refers to the routes that, apart from serving as transit, are also very important from an economic and social point of view and form the economic and social center of the city because all or most of the important economic and social buildings have been built next to them. These routes are called bazaars (Soltanzadeh, 2006, 24). In Isfahan, economic-commercial spaces based on the principle of the hierarchy are formed in the center of the city and the main bazaar. Those with city- or macro-scale use are placed in the city center and the main bazaar. The ones with inner-city and neighborhood-scale use are located in the small bazaars of neighborhoods (Ahari, 2015, 115). The spaces of the city's economic transactions mostly begin with the formation of the routes. The existence of a bazaar, serving as the economic street of the city, is formed and developed in most of the historical cities on the main streets of the city. Also, in Iranian cities, the streets are formed by the shops along them. In this way, the economic dimension of the city is intertwined with the access system. The old textures of traditional Iranian cities have a soft, natural, and free geometry, and repetitive, identical, and uniform shapes and dimensions have never been used in their construction. What harmonizes and unites these textures is the consistency in the spirit governing the construction of the city and the cultural and technical patterns governing its architecture, which have been formed gradually (Moosavi,

Habib & Majedi, 2017, 24). In this context, the neighborhood pattern sometimes has clear boundaries and sometimes lacks clear physical boundaries (Eslami & Aminzadeh, 2013, 38). The street systems in Iranian cities have been rationally built according to the environment and the pre-industrial economy. A grid pattern of main streets has been established in connection with a system of canals used to irrigate agricultural land. The orientation of this network has been determined based on the need felt for rectangular fields and orchards, even the slope of the land. Main streets, as well as many dead-end streets, already existed in farm patterns before sprawling housing was built in these zones. In irregular topography, streams, farm patterns, and houses are also irregular. Therefore, topography and water form the basic principles of residential geography in Iran (Bonine, 1979). For example, water, this vital element, is one of the most important and effective factors in the morphology of water-scarce historical cities in Iran, and it is considered to be a factor shaping the three elements of the interconnected network system, the component system, and the building system (Iranmanesh, Pourjafar, Khatibi & Ziyari, 2021, 33-44). The hierarchy of access from public spaces to private spaces is also one of the prominent features of the streets of historical cities.

Summary of Theoretical Foundations

In general, the access system is an organized system that gives people the opportunity to address their needs. Humans perceive the city mostly through the access system. Urban open spaces and especially urban streets are the centers where social interactions among citizens occur, and the social dimension is one of the most important aspects of the access system. Bazaars as the economic streets of the city with continuous shops at their sides, their scattered existence in the main streets, and their concentration in the centers of the neighborhoods reflect the economic aspect of the access system in the city. Climatic, social, economic, political, and cultural factors are effective in the formation, development, and shape of urban streets. The urban passages are the basis of the access system. In the following section, the study sample is introduced, the dimensions of the access system in the study sample are evaluated, and the qualitative and quantitative tools used to understand the existing system in them are examined.

Case Study

The city of Qazvin was founded in the Sassanid era, and its changes in the post-Islamic era have been accompanied by many ups and downs. Its capital in the Safavid era is a turning point in the history of this city. The most complete and oldest existing map of this city dates back to 1306 AD, marking the beginning of the urban changes in the Pahlavi period. The zone of the mentioned map is located to the south of the modern city of Qazvin (Fig. 1). The study zone includes three historical neighborhoods in the southwest of

the city. The mentioned zone is bounded by the Bazar River from the east, by Baghestan from the south and west, and to the north by the Dimaj neighborhood. The advantage of the selected zone is that it is surrounded by the natural factor of the Bazar River in the eastern part, which determines the border of the neighborhoods of the selected zones compared to other eastern neighborhoods and is limited to the edge of Baghestan in the western and southern parts. The neighborhood centers are distinguished from the sub-neighborhoods by having distinct features in the region, and they are identified with features such as a node of main streets, open spaces, the presence of old trees, and the presence of local service uses such as mosques, baths, reservoirs, bakeries, grocers, barbershops, etc. The mentioned characteristics create a perception of centrality in the centers of the study sample neighborhoods. The centers of the neighborhood zones include the Mughlowak neighborhood center (1), Akhund neighborhood center (2), and Sardar neighborhood center (3) (Fig. 2). The contemporary historical changes of the selected zones based on the map of 1306 and the aerial photo of 2021 show that street constructions from east to west in the north and south of the zone have caused the rupture of the historical inter-neighborhood streets. Developments have also been made in the south and west of Baghestan, and new dead-end streets have been created to access the new parcels. Also, the widening of the streets is evident, but the middle axis (ax) of the historical streets has existed, and most of the streets have preserved their historical shape (Fig. 3). Marking the

Fig. 1. The location of the historical context of Qazvin city and its contemporary development. Source: Authors.
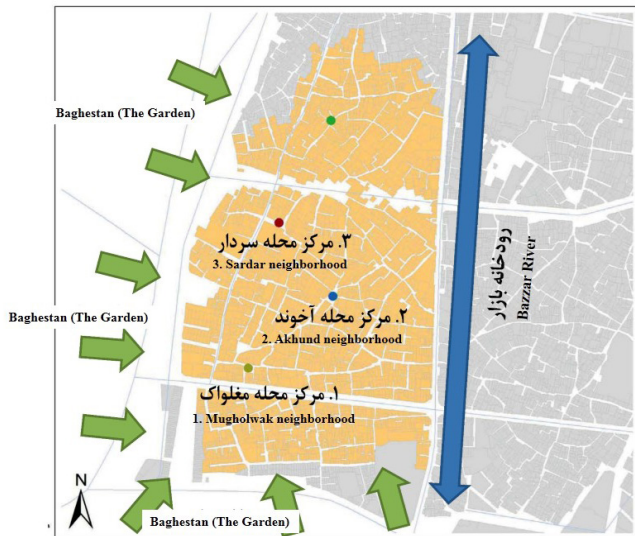
Fig. 2. The zones of the southwest neighborhoods of Qazvin, which are limited by Baghestan and the Bazar river. Source: Authors.
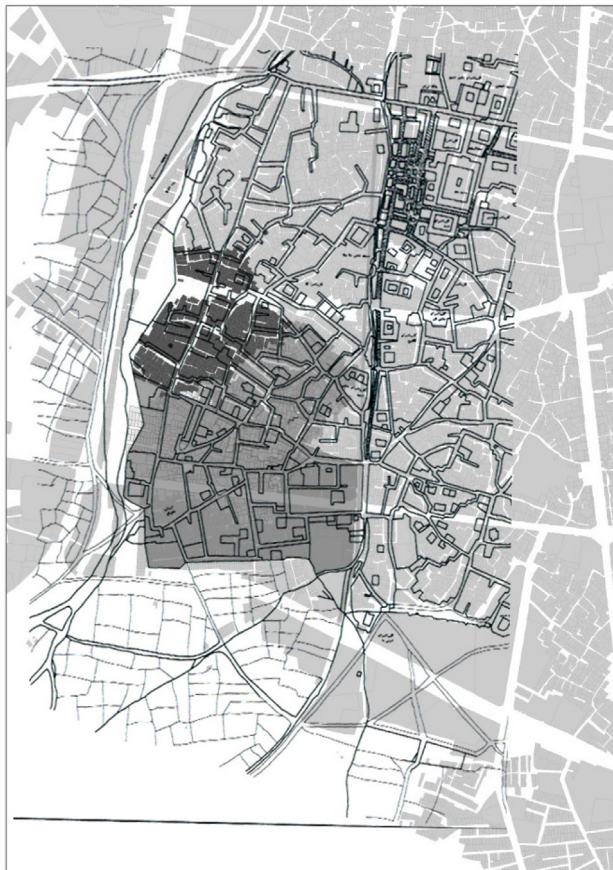

Fig. 3. Matching the zones of southwest neighborhoods in the historical map of 1927 with the current situation. Source: Authors.

boundary of a neighborhood as an independently organized set was given priority. Determining the border of the neighborhood was done by determining the last parcel that had the closest access to the center of the neighborhood, or, in other words, determining the parcel that had the closest access to the center of the neighborhood rather than other centers

of adjacent neighborhoods. After the demarcation of the neighborhoods, the quantitative data of the streets and parcels extracted were summarized for comparison and analysis. To determine the boundaries of the neighborhoods, first, the dead-end or open-end streets that access the neighborhood centers were coded (Fig. 4). Then the access length of each parcel and the closest access for the parcels that were placed between the two neighborhoods were determined (Fig. 5). Behind the boundary of the last parcel, which had the closest access to the center of the neighborhood through the dead-end or dead-end intersection, was considered the border of the neighborhood (Fig. 6). After determining the boundary of the three neighborhoods of Mughlowak, Akhund, and Sardar, all its accesses were coded and their length was extracted (Fig. 7). The length of the streets of each of the neighborhoods is shown in Figure 8 with a separate color with pale to full spectrums.

Findings of the Study Sample

In this section, the findings of a study sample based on the fundamental characteristics of a system are provided. In brief, the fundamental features of the system include five items. In the following section, the system features are first detailed, and then the findings of the study are presented. It is worth mentioning that the system consists of different parts working together (Alem, 2013, 149). The number of parcels[1] in the first neighborhood is 839 while this number in the second neighborhood is 957. The third neighborhood includes 501 parcels and the average number is 765. The processes of changes in historical contexts including inheritance, street construction, change of use, increase in population, and land value have played an important role in dividing them into smaller pieces. The occupancy percentage of the area of the parcels in the whole neighborhood is 85.14% among the three neighborhoods. However, the difference is less than 1% (Table 2). The findings show the parcels (Fig. 9) in five distinct categories of three neighborhoods. The frequency, and zone, with a difference of less than 15% can be seen in Table 3.

Examining the sum of the parcelization events as well as their average zone in each of the three neighborhoods indicates that the average area of the parcel is close to each other, especially in the first three categories of parcels (Table 4). Therefore, in the three neighborhoods of the study, there are variations in the areas in five categories. The varied area of the parcel is indicative of the organization in the historical context, which has provided the possibility of providing residential land for citizens with different economic levels from an economic point of view. Examining the numbers and areas of the streets in the study sample show some differences in frequencies. The total number of dead-end streets in the first neighborhood is 61, the second neighborhood is 94, and the third neighborhood is 37; respectively, the zones of the mentioned neighborhoods are also different (Tables 2 & 5). Calculating the numbers and areas of
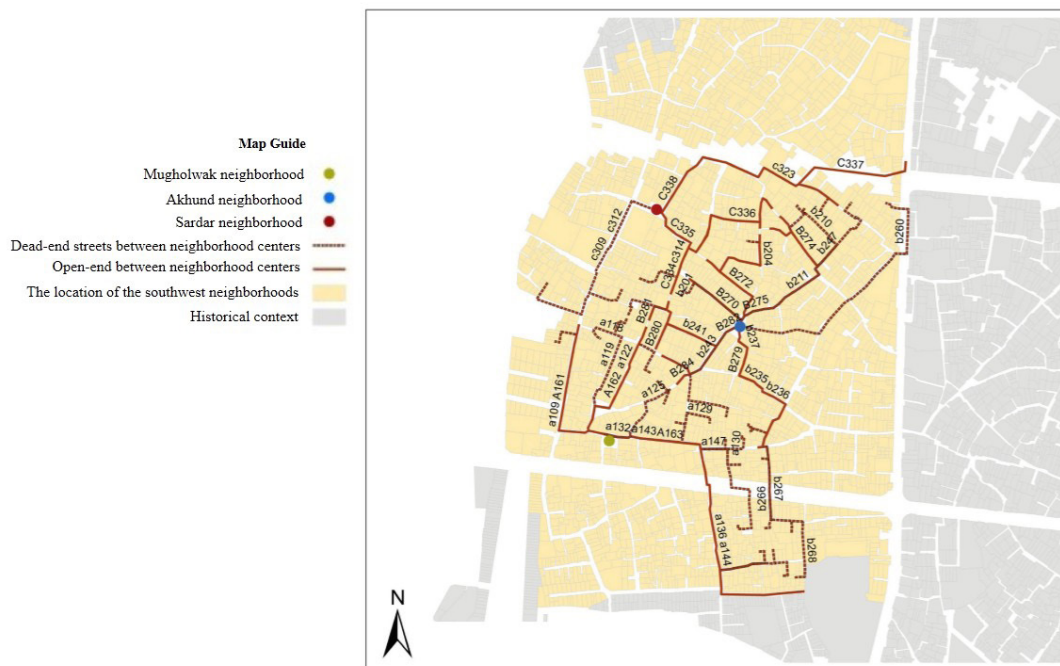
Fig. 4. Coding the streets that have direct access to the three neighborhood centers of the selected zone. Source: Authors.
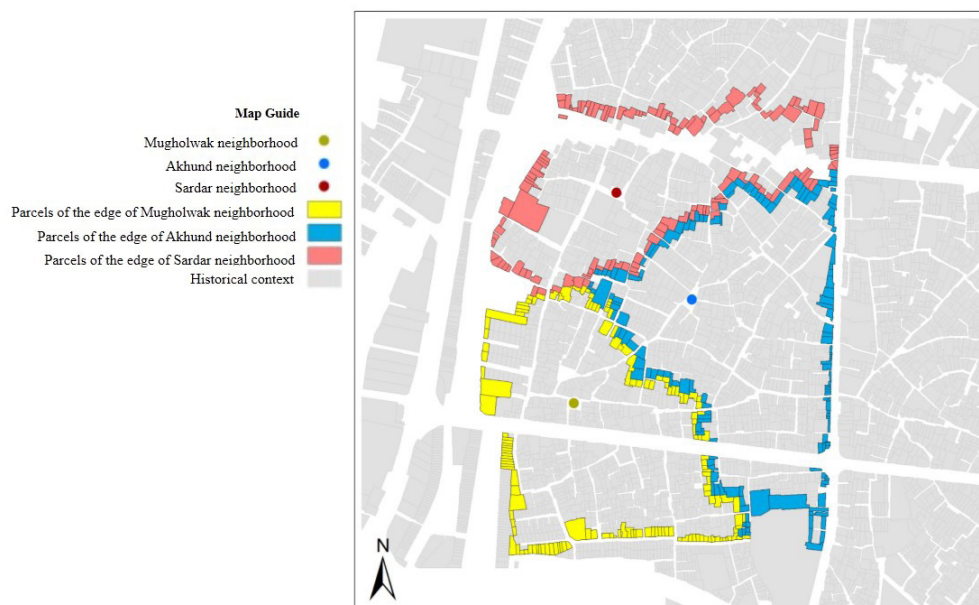

Fig. 5. The farthest parcels of each neighborhood that have the closest access to the center of their nearest neighborhood through streets. Source: Authors.

Table 2. Parcels and streets of the selected block in the existing state excluding the new streets Source: Authors.

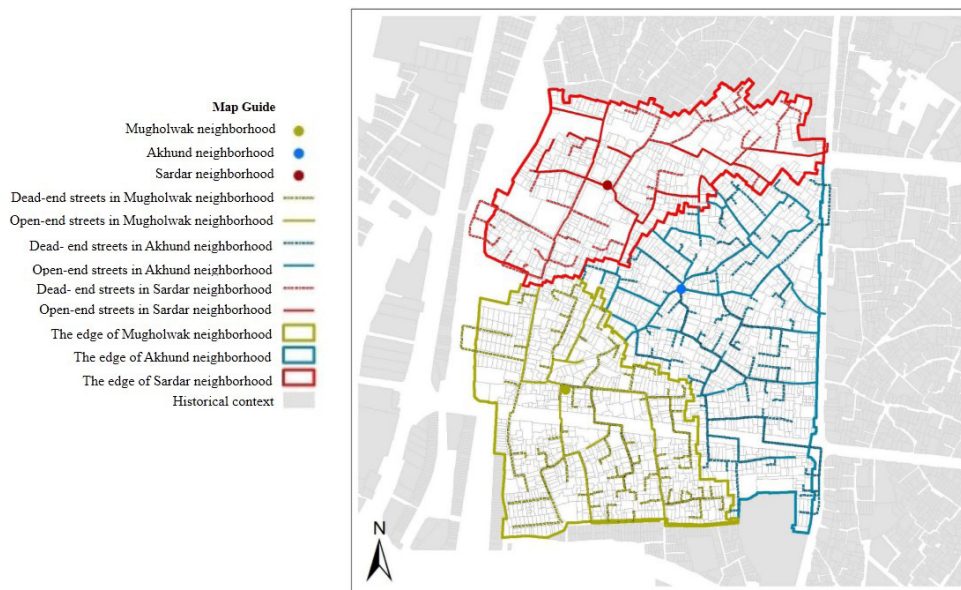| Neighborhood	Area of Neighborhood	Street construction	Parcels			Streets	
			Count	Area	Percent(Area)	Area	Percent
Mughlowak neighborhood	152317	11250	839	128388	84.29	23929	15.21
Akhund Neighborhood	184737	6150	957	158486	85.79	26251	14.21
Sardar Neighborhood	120238	20500	501	102487	85.24	17751	14.76
Total	457292	37900	2297	389361	85.14	67931	14.86
Average	152431	12633	765.67	129787	85.14	22644	14.86

Fig. 6. Bordering three neighborhoods based on the latest parcels that have the closest access to the center of the neighborhood. Source: Authors.
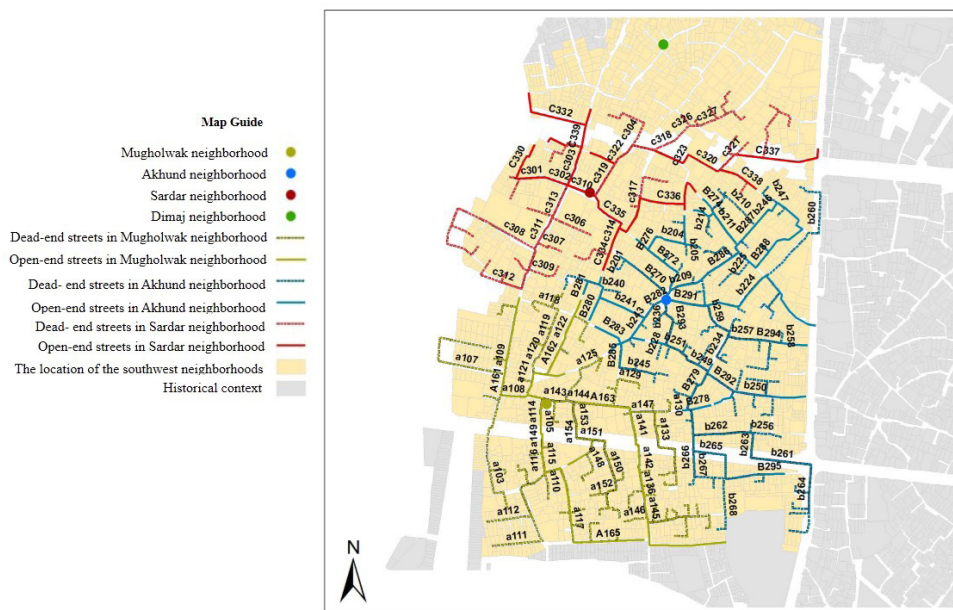

Fig. 7. Coding of all dead ends and dead ends of each of the three neighborhoods. Source: Authors.

Table 3. Parcelization in each of the three neighborhoods. Source: Authors.

Neighborhood	Neighborhood 1				Neighborhood 2				Neighborhood 3			
Parcelization	Number		Area		Number		Area		Number		Area	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	percent	Frequency	Percent
0-100	300	36	21262	17	253	26	16472	10	116	23	7916	8
200-100	380	45	53841	42	478	50	69564	44	225	45	31957	31
300-200	105	13	24559	19	147	15	35203	22	87	17	20512	20
500-300	35	4	13408	10	66	7	24956	16	50	10	17951	18
500 Above	19	2	15318	12	13	1	12291	8	23	5	24151	24
Total	839	100	128388	100	957	100	158486	100	501	100	102487	100

streets in the selected neighborhoods shows that their frequency does not have a specific ratio, but the average percentage of the zone occupied by the streets in the entire neighborhood is 14. 86 percent, which is less than 1 percent in all three neighborhoods. The passages of the studied neighborhoods are different in number, length, and zone as components of the system, but the percentage of their zone occupied in the three neighborhoods is close to each other. Therefore, the passages in the historical neighborhoods of the city are made up of different components that have created a system. Second, the system is not a mere gathering of components; rather, these components must be organized systematically. There must be a systematic relationship between them (ibid., 149). The possibility of accessing the neighborhood center depends on the amount of communication that can be established between the users of the center and the residents of the neighborhood. This function is mostly dependent on the part of residents
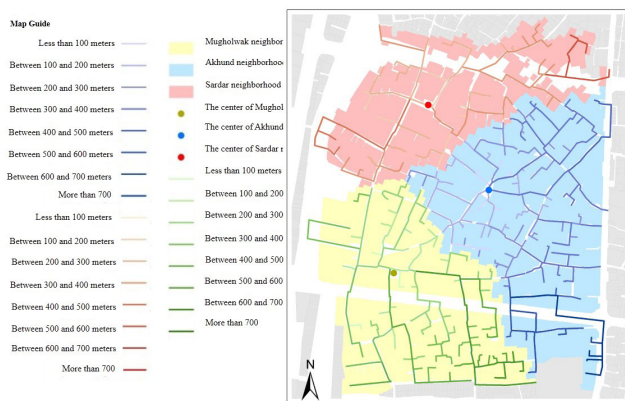

Fig. 8. The range of the streets in each neighborhood based on their length. Source: Authors.

who live within walking distance from the center of the neighborhood. The number of pedestrians should be enough to make a permanent demand for services and retail goods at the center (Saeednia, 2019, 77). Although the standards of new cities may be different from those of traditional cities, they are used to make a distinction. The walking ability of people living in the neighborhood and the location of neighborhood centers define a structural order in local access. The average length of the streets in the three neighborhoods of the study sample is 284 meters (Table 5), and with the speed of human walking (on average about 5 kilometers per hour), the average walking time in the passages of the study is less than 4 minutes. In this way, the population living in each neighborhood in the sample mostly walks to the center of the neighborhood where they live, and this population is a permanent source of demand for ritual needs, services, and retail in the center of the neighborhood. The pedestrian-orientedness of the local streets in the study sample highlights the economic aspect but shows how they serve as platforms for social interactions in the local access system. Therefore, there is a systematic relationship in the sample neighborhoods between the neighborhood population and the accessibility to their neighborhood centers. The third feature of every system is that a pattern should be created from the organization and arrangement of these components (Alem, 2013, 150). A pattern is the production of things that are repetitively occurring. The analysis of the study sample shows that the figures associated with the arrangement of neighborhood passages in the radius of access and the length of the streets are almost the same. The distance between the centers of the first and second places is 335 meters; the first

Table 4. The sum of the parcelizaion events and their average zone in each of the three neighborhoods Source: Authors.

Parcelizaion events	Sum of Counts		Sum of Areas		Average area (square meters)			
	Frequency	Percent	Frequency	Percent	Neighbor 1	Neighbor 2	Neighbor 3	Total
0-100	669	29	45650	12	71	65	68	68
100-200	1083	47	155362	40	142	146	142	143
300-200	339	15	80274	21	234	239	236	237
500-300	151	7	56315	14	383	378	359	273
500 Above	55	2	51760	13	806	945	1050	941
Total neighborhood	2297	100	389361	100	153	166	205	170

Table 5. Number and length of passages (dead ends and dead ends) and their average. Source: Authors.

Neighbor	Dead End			Open End			Total		
	Number	Length	Average length	Number	Length	Average	Number	Length	Average length
Mughlowak neighborhood	55	15995	291	6	1894	316	61	17889	293
Akhund Neighborhood	68	18965	279	26	6617	255	94	25582	272
Sardar Neighborhood	27	8338	309	10	2751	275	37	11089	300
Total	150	43298	289	42	11262	268	192	54561	284

and third places are 428 meters; and the second and third places are 272 meters. If about half of this distance is located in each neighborhood, their average half-distance is 172. 5 meters. The comparison between the three neighborhoods shows a difference of less than 20%. The arrangement of the distribution of neighborhood centers is for equal access of residents to the microeconomic activities in the centers as well as the local social activities. The analysis of the length of the streets (Table 5) of the sample neighborhoods shows that the average length of the streets of the studied neighborhoods is 284 meters, which is different from the average length of the streets in neighborhood one, + 9 meters. This value for neighborhood two is + 12 meters, and for neighborhood three is + 16 meters. All three have changed less than 10% of the overall average length of the streets. The comparison of the access radius of each neighborhood and the average length of their streets show that the extracted values for all three neighborhoods are close to each other and are repeated.

The fourth feature of the system is that there is a fundamental relationship between the components of the system. Each has a specific use. The system is related to each component, and each component is related to the system (ibid., 150). Historical passages have different components such as streets, bazaars, bazarche (in English small bazaars) Kuche Bagh (in English garden alleys), horse crossings, pedestrian crossings, carriage roads, dead ends, open ends, alleyways, etc. There is a connection between the alleyway, as the smallest component of the access system, which is mostly a private passage, and the street, as the largest public passage of the city, which creates the hierarchy of the city's access. Types of roads as a hierarchy of access include main streets, secondary streets, dead-end streets, and Kuche Bagh (Soltanzadeh, 2006, 26). There are all kinds of passages in the study sample (Fig. 10) except Kuche Bagh which used to be in the past and disappeared over time. The population of a neighborhood unit in small cities or urban zones with low density is about 4000 people. This value in densely populated zones of the metropolis reaches 2000 and in the middle parts of the city with medium density, it reaches 10000 (Saeednia, 2019, 66). If the size of the household is considered to be 4, in urban zones with low density, there are 1000 households in a neighborhood unit. Another example of the standard number of households for a neighborhood is 700–1250 households (Habibi & Masaeli, 1999, 7). The number of households in a parcel may affect the number of floors, but most of the parcels in the study sample are one–story. The average number of neighborhood parcels in the study sample is 765, which is close to the minimum number of households in the urban population book. There is also a proportionality of the minimum value in the access radius so that the standard minimum is 300 meters (the same) and the average study sample is 284 meters (Table 5). The proportion of the population and access radius in the study sample, like the access hierarchy, shows the relationship between each

component and the other component in the study sample. The fifth and last feature of the system is that parts form a single whole. Although each component has different tasks, it is functionally related to other components in a way that creates a new unit. A deficiency in any component may affect the work of the system (Alem, 2013, 150). Small cities have only one center or nucleus. However, in medium-sized cities, new nuclei or centers gradually emerge in new residential zones and provide local or regional needs (Saeednia, 2019, 15). As mentioned before, in the study sample, the difference in the average radius of access to the centers of the three neighborhoods is less than 20% while that value in the average length of the streets in the three neighborhoods is less than 10%. There is a difference of less than 1% in the percentage of occupancy of the zone of the parcels and the zone of the street in the three neighborhoods (Table 2). The closeness of the values in the sample indicates the boundary of the neighborhood system based on the radius of access and the number of households. In other words, population overflow and the increase in the length of the passages cause

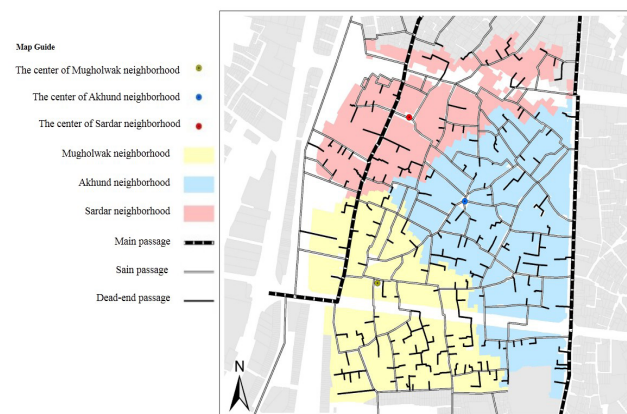Fig. 9. The parcels of each of the three localities Source: Authors.

Fig. 10. Hierarchy of access to three localities. Source: Authors.

the birth of a new neighborhood. Also, the creation of a new neighborhood center is subject to the distance of the passages and the population of the neighborhood. The specific ratio of the size of the parcels to the access to the center of the neighborhood defines the neighborhood as a small, orderly, and independent unit in the city. Every component of the passage system is hierarchically connected with others, and its absence creates a disturbance in the passage system. Street constructions in the north and south of the study sample zone (Figs. 9 & 10) have caused a lot of damage to the use of the sample neighborhoods. However, this issue needs to be examined in another study and is not within the scope of this research.

Discussion

A comparative study of historical maps and aerial photographs of the study sample shows contemporary changes in the streets of the study zone. Moreover, the data shows that the streets have become wider than those in the historical map, but the middle axis (ax) of the streets still exists and there are no changes in their shapes. The existence of a hierarchy of access in the passages of all three neighborhoods and the existence of the center of the neighborhood with the mentioned characteristics have shaped people's perception of the neighborhood. The concentration of the activities needed by the residents in the center of the neighborhood and the possibility of walking have contributed to social interactions on a local scale. Examining the position of the neighborhood centers to each other shows that the distance between the neighborhood centers is in a balanced position. The economic aspects of the local access system have been shaped by the existence of retail sales of goods and services in the center of the neighborhood, their suitability with the population, and the possibility of accessing them on foot. Although the criteria of historical cities are diverse and very different from the standards of new urban development plans, they have been used to make comparisons among samples possible. Comparing the standards in the neighborhood (neighborhood unit) with the study sample show that, both in terms of the number of components and the access radius of the study sample, they are close to and balanced at the minimum of both indicators. At first glance, the analysis of the granularity and zone of the fabric parts seems irrelevant to the street system because the use of each parcel plays a more important role in the formation of the streets. However, the frequent changes in the uses of the textures over time and the lack of documents to refer to the uses in different periods make it impossible to make a proper comparison. The zone and granularity of the textures have also changed at a slower rate, but it is possible to cite and compare them through documents. The comparison of the three neighborhoods with each other show that the changes in the average length of the streets in the studied neighborhoods were less than 10 percent

of the average. The changes in the occupancy percentage of the parcels and passages of each neighborhood are less than 1% of the total zone. Repetition of close figures of the characteristics of passages and parcels indicates the existence of their proportions and balance in the triple neighborhoods. In short, comparing the five fundamental characteristics of the system with the characteristics of the sample historical neighborhoods show that all five mentioned characteristics can be seen in them, and the passages of the study sample have a system.

Conclusion

The study of research on the structure of historical contexts shows that contrary to the claim of chaos, the passages of historical contexts have a solid system. The network of streets has a functional hierarchy and is an organized whole. It has the highest importance in the citizens' perception of the city, and on a smaller scale, passages, alleys, dead ends, open ends, and alleyways are the basis of the citizen's perception of the city's neighborhoods. Citizens' perceptions of the city are mostly based on their perceptions of the access system. The daily communication of citizens, tourists, and visitors to the city is formed in public urban spaces and urban passages. Passages, as the platform of the access system and the place where citizens express their opinions in different ways, are one of the most important social and political demands of the city. Several factors, such as cultural and social, economic, political, military, climatic, topographic, irrigation, and agricultural networks, means of transportation, and requirements of each period, play a role in the formation of historical cities. Especially the use of passages and their borders play an important role in determining their width, length, and shape. For example, the width of the pass, based on its use in historical neighborhoods, moderates the climate and creates a dense residential texture. Bazaar, as the most important economic zone of the city, is one of the pillars of the Iranian city, and its formation and development occur in the main passages of the city. The body of the street in an Iranian city is shaped by shops, and the definition of the use of parts on the sides of the street is associated with its economic aspect. Knowing the study sample also showed that there is a distribution of service needs in the neighborhoods. Also, the diversity of the zone of residential parcels in the study sample has caused the neighborhood to have citizens of different economic levels. Therefore, one of the prominent aspects of access systems is their economic dimension. Matching the five fundamental characteristics of the system with the characteristics of the sample show that the passages and parcels of the studied neighborhoods as components of the system are different in terms of the number, length, and zone of each parcel, but the percentage of the zones occupied by the parcels and their passages in the three neighborhoods is close to each other. Moreover,

there is a close relationship between the population and the accessibility of the neighborhoods by pedestrians in the study samples. The comparison of the access radius of the neighborhoods and the average length of the streets show that the extracted values of all three neighborhoods are close to each other and repeated and follow a pattern. The system in the study samples reflects the existence of an access hierarchy, a population proportion, and an access radius, which show the connection between each component with others. The last feature of the system, based on inference from the sample is that with an increase in population or the

length of local accesses, over time, new neighborhoods are formed depending on the center of their new neighborhood. Likewise, each component of the passages is hierarchically connected with others, and its absence creates a disturbance in their system. Therefore, matching the characteristics of a system with the characteristics of the study sample neighborhoods shows that their passages have a system. In general, the recognition of the organization and arrangement governing the transitions of the historical context shows that the transitions of the historical context have a system, and their perceptual, social, and economic aspects are prominent.

Endnote

* This article is extracted from the doctoral dissertation of "Ehsan Dizani" entitled "Recognizing the role of accessibility in the conservation of the historic city(Case study: Qazvin)" which is being carried out under the supervision of Dr. "Eisa Esfanjary Kenari" in the Department of Conservation and Restoration of Isfahan University of Arts.
1. The meaning of parcel is all the parts of the neighborhood except the streets.
2. In this study, the term neighborhood is Mahaleh in Persian. The traditional Mahallat of Iran was created as a result of strong social cohesion and integration between the residents who had common values, and it serves as a basis for the residents to protect themselves from collective conditions, and in this way, it strengthened the spirit of cooperation and neighborly relations (Eslami Aminzadeh, 2013, 41).

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