LEGIBILITY OF SAFAIEH NEIGHBORHOOD
IN THE CITY OF YAZD, IRAN

Masomeh Roustaei Sadrabadi[1], Norsidah Ujang[1*] and Somayeh Roustaei Sadrabadi

[1]Dept. of Landscape Architecture, Faculty of Design and Architecture,
Universiti Putra Malaysia, Selangor Malaysia

*Corresponding author:
norsidah@upm.edu.my

ABSTRACT

Cities are developed to support human activities and well-being. Facilitating human activities depends on the structures and characteristics of the physical elements of cities. In Iranian cities, it is observed that in new urban areas such as Safaieh neighborhood, most residents are facing challenges to find their way around. This is because the physical elements are unable to conjugate the psychological aspects to enhance legibility of the environment. In this respect, scholars and researchers of environmental design and environmental psychology fields argued that there is a strong relationship between arrangement of the physical elements and legibility of the city. To enhance legibility of Safaieh neighborhood, this study aims to identify physical elements and psychological aspects of the urban environment to enrich people's wayfinding and orientation. The elements can be classified into landmarks, paths, nodes, edges and districts. The study examines the effects of such physical elements on the psychological aspects helps human wayfinding and orientation. The study adopted field observation, questionaire survey and interview to identify physical elements and to examine those effects on people's wayfinding and orientation in Safaieh neighborhood. The study found that from the perspectives of the respondents, the physical elements are not legible enough to provide clear image for residents to have a good perception of environmental information. The findings assist urban designers to understand the effect of physical elements and to develop strategic plans to enhance the legibility of urban setting. Therefore, the outcome could be used to improve wayfinding and orientation ability of residents in different neighborhoods in Iranian cities.

Keywords: Urban legibility, wayfinding, orientation, landmark, Safaieh neighborhood

1. INTRODUCTION

In recent years, discussions on the urban environment have increasingly focused on the wayfinding, orientation and urban legibility (Tang, 2011; Yaski, et al., 2012). It is due to this reason that a city is defined as an object that can bring changes on human beings psychology to understand or perceive physical environment (Long, 2007). Human psychology is directly proportional to its ability of orientation and wayfinding which refers to as where a person is and how to get to where the person is going (Lynch, 1960). According to Lynch, people's ability for wayfinding and orientation is extremely essential to connect to his or her survival and sanity. On the other hand, urban environment can simplify or limit the person's wayfinding and orientation (Rapoport, 1977; Lynch, 1981; Devlin, 2001).

Research Problem

Today, urban environment has increasingly faced with rapidly developing urban areas, particularly, in the developing countries like Iran (Habitat, 2001; Zanganeh Shahraki, et al., 2011). Rapid urbanization has affected wayfinding, orientation and urban legibility in the cities. In this respect, some researchers opined that a legible environment is a key factor in improving wayfinding and orientation (Battle and McCarthy, 2001; Ewing, et al., 2005; Yaski, et al., 2012). Besides, a legible environment can limit and facilitate human behavior through a cognitive map. In fact, the term cognitive map is referred to as a cognitive process that includes the acquisition, representation, and processing of information in regards to actual physical settings (Downs and Stea, 1973; Moore, 1979; Evans, et al., 1980; Golledge and Stimson, 1997; Long and

Baran, 2012). Also, Yun and Kim (2007) investigated the interrelationship between spatial cognition and configuration, and the effects of turns in path (depth) and metric distance in forming spatial cognition by using Space Syntax in Istanbul, Turkey. They found that there is a strong interrelationship between the syntactic properties and spatial cognition as indicated in the cognitive map (Yun and Kim, 2007). This study focuses on legibility on city streets in Safaieh neighborhood in Yazd. Yazd is located at the eastern part of Isfahan and to the south of Kavir-e-Loot in the central part of Iran (Bonine, 1980). Since thousands of years ago, Yazd is the center of heritage, culture and art. It includes many unique architectural sites and urban structures. It is claimed that a legible neighborhood should be easily identifiable based on physical elements and psychological aspects (Kelly and Kelly, 2001).

According to Maslow (1943), there is a strong relationship between physical elements of the environment and the psychological aspects which is translated in the people's image ability of the setting. According to him, human's cognitive system is influenced by human psychological needs (Lang, 1987). He believes that a person can identify with a legible space or place that can meet his/her belonging, safety, aesthetic and cognitive needs.

In last decades, the historic city of Yazd has faced a difficult challenge on the urban design (Shamsollahi, et al., 2012). The rate of urbanization in Yazd has increased from 75.8 to 81.4 between 2009 and 2011 (ISC, 2012), while the increase in urban population has contributed to the decrease in the quality of life of urban dwellers. However, the rapid urban development has resulted in uncontrolled transformation of traditional and historic urban texture and rapid urban development in the modern areas with lacking in visual and physical coherence (Montazerolhojjah, et al., 2012; Shamsollahi, et al., 2012).

Research Objective

The objective of the study is to identify physical elements in Safaieh neighborhood and to examine the effect of physical elements on people's wayfinding and orientation in such newly developed areas of Yazd city, Iran.

2. METHODOLOGY

The study adopted qualitative and quantitative methods to identify physical elements in the new area of Yazd city in Safaieh neighborhood.

Study Area

Safaieh neighborhood has been chosen as the case study. The neighborhood is one of the famous neighborhoods in the city of Yazd. According to Iran Census Statistic Center, it has a current population of over 70 million (2006). The Yazd province is located at the center of Iran. Yazd has an area of 131,575 km², and according to the most recent divisions of the country, is divided into eleven towns: Maybod, Mehreez, Taft, Ardakan, Behabad, Khatam, Sadogh, Bafq, Abar Kooh and Yazd, the capital. According to the 1996 census, Yazd province had a population of about 750,769, of which 75.1% were urban residents while 24.9% resided in rural areas. In 2006, Yazd had an estimated population of 1,033,291. Yazd has been selected for this research due to it's traditional, historical and cultural attributes. According to UNESCO, Yazd is the second historic city in the world (2008). The particular climatic problems caused the people of the hot, arid zone to find solutions through their settlements. The high radiation and temperature in the summer, diurnal variation of temperature, seasonal variations from dry, hot summer to cold, dry winter, low humidity, limited water supplies and the dusty winds are the most important factors in forming the urban structure of Yazd (Shamsollahi, et al., 2012).

Safaieh is located nearby (2.5 kilometer from Atlasi sq.) one of the major universities in Yazd which is called Yazd university. Safaieh district is situated in approximately south of Yazd which is in fact the rich neighborhood of the city. In addition, most of the city's commercial centers and shopping malls are concentrated in this neighborhood. For this reason, this area is usually overcrowded. There is a growing trend toward apartment dwelling in Safaieh district, despite the abundance of land. Hence, many apartments have been so far built or are being constructed.

Safaieh is one of the newly formed areas developed as a result of population growth in Yazd. Life style of Yazdi people in Safaieh varies from those living in the central part because:

1. Situation of the universities and tourist attractions in this area brings students and visitors from all over the country to this place and as a result of cultural interaction; the life style in Safaieh is affected and tends to move towards modernity.

2. Since majority of the new generation of Yazd citizens aspire to live a

different and luxurious life, they leave traditional areas of the city and move to Safaieh district and such trends majorly widens the cultural gap between traditional and modern parts of the city.

Figure 1 Safaieh and historic part locations in Yazd city (Source: Yazd Municipality 2010)
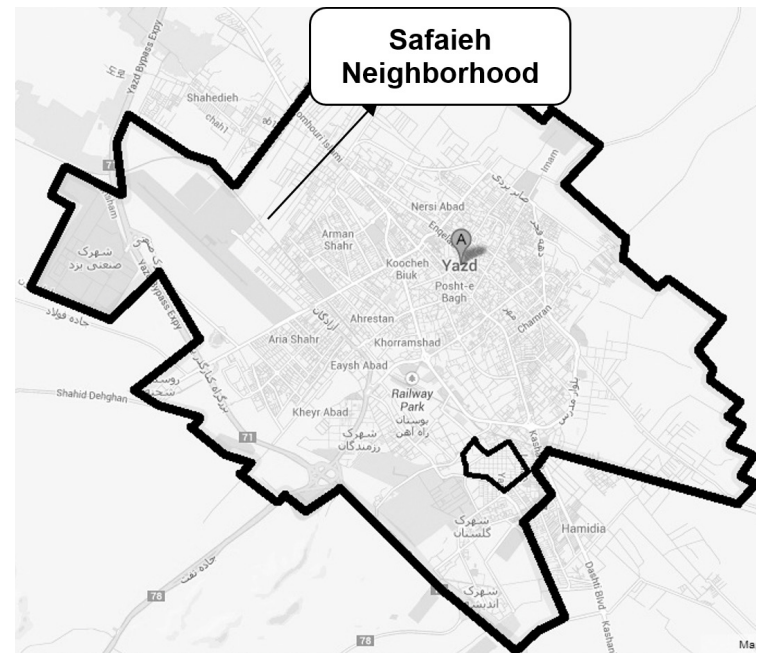

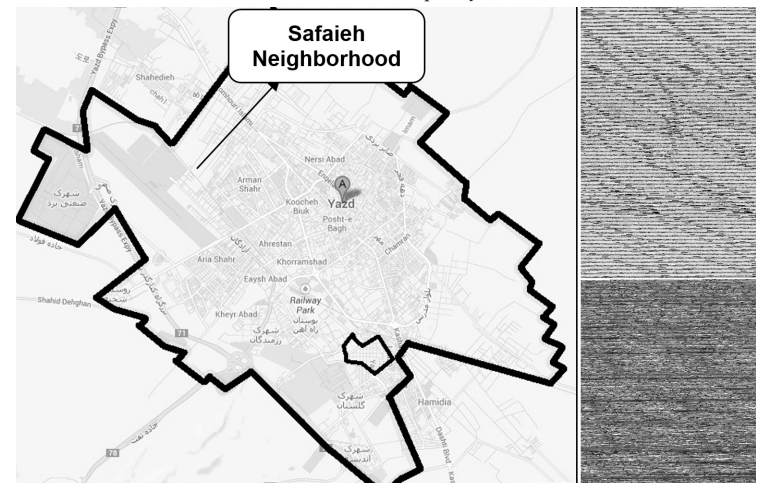*Figure 2 Safaieh location in Yazd city (Source: Yazd Municipality (2010)*

Figure 3 Safaieh location and Yazd University (Source: Yazd Municipality 2010)

- Safaieh Neighborhood is a modern area in the historic city of Yazd. As it has been referred in early sections, modern urban areas hold enormous challenges for urban planners in developing countries, specially, in Iran. In this respect, researchers believed that urban planners were unable to make legible environment in the new urban development (Golkar, 2000; Shamsollahi, et al., 2012). In other words, the quality crisis is the most significant challenge in the new urban areas in Iran, particularly in Yazd city.

- Although there are several new neighborhoods with various features in Yazd, Safaieh neighborhood is one of the most recent, modern, largest and the most famous one in Yazd city. Moreover, severity of legibility problems distinguishes it from the majority of neighborhoods in Yazd (Pourjafar, 2010).

Study Methods

This research is a single case study using multiple objectives (quantitative) and subjective (qualitative) methods which examines the effect of physical elements on wayfinding and orientation of a place and its impact on legibility based on the case study. This research follows descriptive method which deals with research questions. Quantitative survey research is sometimes portrayed as being sterile and unimaginative but well suited to providing certain types of actual descriptive information (De Vaus, 2001; Creswell, 2008). In addition to quantitative methods, qualitative methods are adopted, which are often regarded as proving data about real life people, situations and being more able to make sense of behaviour and to understand behaviour within its wider context (De Vaus, 2001).

The data collection is associated with objectives of the study. The selected methods are: field observations, questionnaire surveys and interviews (with sketch mapping). In order to design the questionnaire a framework was required; this conceptual framework was based on theories related to the topic and concerns observed from field observation. The theoretical constructs were identified and variables for measurement were developed to fulfill the objectives of the study. In addition, survey interview and sketch map were applied to clarify and complement the results from the quantitative methods.

Today, the most common tools used by researchers are direct observation and self-reporting, which permit them to better understand the problems. Therefore, this research seeks to assess the physical elements of Safaieh neighborhood. For this study, the researcher has used photography technique to identify these five physical elements (landmark, node, district, path, edge) in the neighborhood while using sketch mapping to document the respondent's identification of the legible elements. The respondents were asked to draw and label maps of Safaieh neighborhood by representing significant streets and buildings based on their understanding and experiences in relation to the physical elements. The interviewer justified interviewees that the purpose of the sketch mapping is as a guide for the visitors to orient themselves and find their way in the neighborhood.

Interview was carried out after the sketch mapping. One of the advantages of this method is that the researcher can obtain a great deal of information about the process and data required. In this study there are two groups of variables; independent variables and dependent variables. The independent variables are physical elements (landmarks, nodes, paths, districts, edges), while the dependent variables are psychological aspects (wayfinding and orientation).

Pilot test was applied in order to evaluate the questionnaire. Therefore it should be evaluated by a group of people before the final administration could be carried out (Bateson, 1984; De Vaus, 2001). It is pointed out by Vaus (2001) that the best approach to be used in conducting a pilot test is that it should be conducted among the participants who will be used in the actual survey. In this study, pilot test was carried out among thirty residents in Safaieh neighborhood, Yazd city. A total of thirty participants participated for the pilot test. This number is the minimum requirement for sample size (n 30) recommended by Ahmad Mahdzan, (2013).

A cursory look at Table 1 shows that the Cronbach's alpha values are well above the cut – off value and ranged between 0.769 and 0.953.

Table 1: Reliability of the survey results

Construct	No. of variables	Cronbach's α	Remark
Physical Elements	15	0.863*	Pass
Wayfinding and Orientation	18	0.855*	Pass

Source: Filed survey

One of the important stages of the research is data analysis. In order to analyze the data, SPSS version 19.0 was used. Descriptive analyses are used to provide simple summary of the data as well as analyzing the demographic profile (analyzing of participants' background) using frequency and means analyses, and inferential analysis was applied to test the hypotheses of the study.

3. RESULTS AND DISCUSSION

Based on the statistical analysis of the questionnaire survey data from the field observation was included. Descriptive statistics include the demography of participants and measurements of the data which evaluate the variables in the study. The participants of this study had different backgrounds in terms of gender, age, and educational level, place of stay, ownership and duration of stay. Table 2 shows the result of participants' background. There were 72 males (70.6%) and 30 females (29.4%). The majority of the participants were in the age group of 18 to 25 years old (76.5%), followed by 26 to 46 years old (17.6%), and the age group of 47 to 67 years old (5.9%).

Table 2 : Frequency distribution of demographic characteristics

Category		Number	Percentage
Gender	Male	72	70.6
	Female	30	29.4
Age	18-25	78	76.5
	26-46	18	17.6
	47-67	6	5.9
Education	High school	7	7.0
	Collage	72	72.0
	Graduate school	21	21.0
I am	From Yazd	46	45.1
	Not From Yazd	56	54.9
Ownership	Own	35	34.3
	Rental	15	14.7
	Hostel	51	50.0
Duration of stay	Less than 12 months	29	28.7
	1 to 3 years	17	16.8
	3 to 5 years	12	11.9
	5 to 10 years	4	4.0
	More than 10 years	39	38.6

Source: Field survey (2012)

The physical elements in Safaieh neighborhood were identified through observation, as well as taking photo. The observation was conducted inside the neighborhood in order to find out the physical elements based on the categorization of the Lynch which are landmarks, nodes, paths, districts and edges. The result of observation is showed in the Table 3.

Table 3 Physical elements observed

Physical Elements	Items				
Landmarks	Hotel Safaieh	Aria Shopping mall	Yazd University	Dakhmeh (Tower of Silence)	Tak Cinema
Nodes	Transit stops	Atlasi Square	Emam Hasan Square	Pajoohesh Intersection	Sepah Bank
Districts	Hostel of Yazd University				Illia Shopping mall
Paths	Sidewalk				
Edges					

Source: The author (Field observation, 2012)

1.Hotel Safaieh   7.Atlasi Square   13.Sidewalks
2.Shopping mall Ilia   8.Pajohesh Intersection   14.Hostel
3.Shopping mall Aria   9.Emam Hasan Square
4.Bank Sepah   10.Tak Cinema
5.Yazd University   11.Sign board
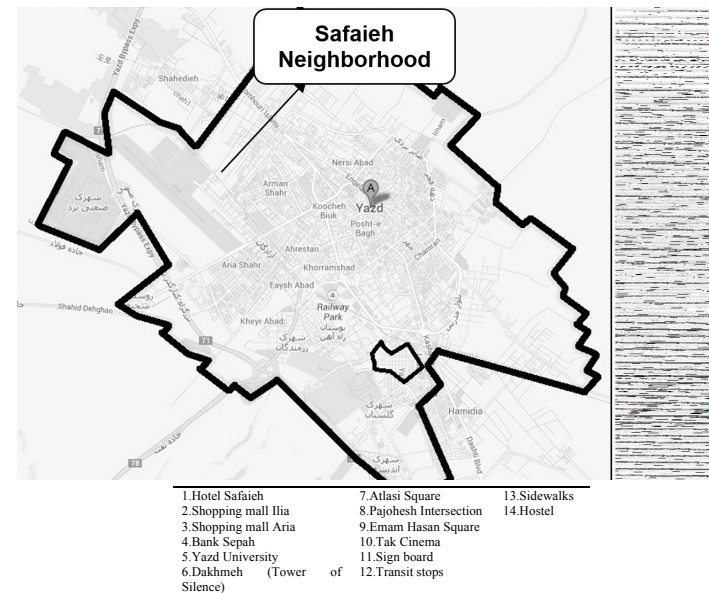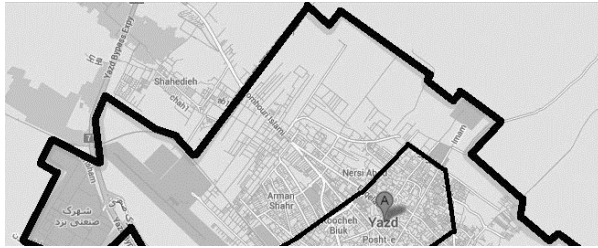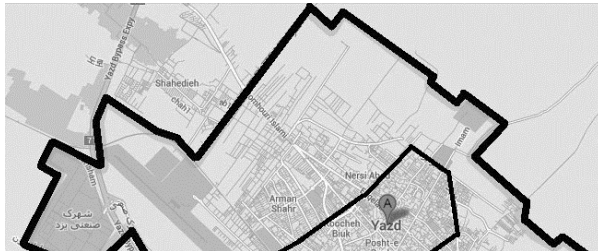6.Dakhmeh (Tower of Silence)   12.Transit stops

Figure 4 : Safaieh neighborhood (Source: Yazd Municipality, 2010)

Physical elements are illustrated in Figure 5. These elements have several attributes which are crucial for ranking a place (Lynch, 1960).
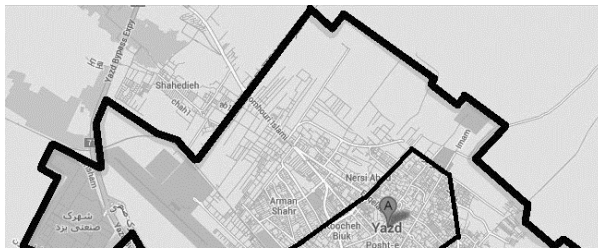
- Landmark: Reference point from exterior of any direction and distance which having some specific form that are in contrast with background context (Lynch, 1960).
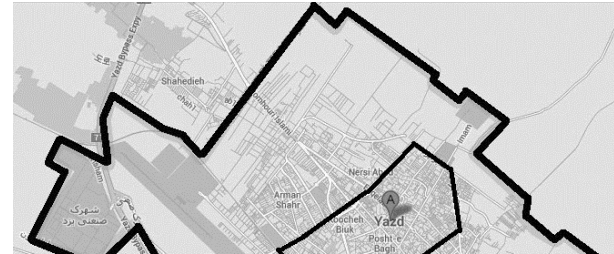
1. Hotel Safaieh (Landmark)
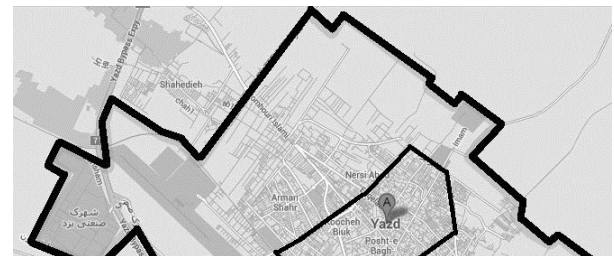

2. Aria Shopping Mall (Landmark)
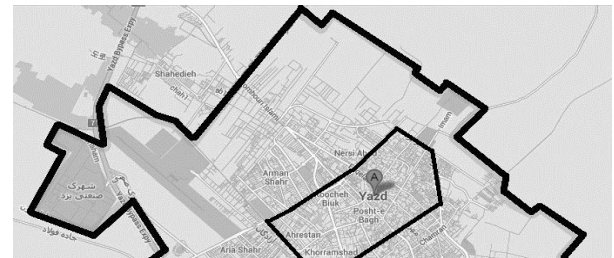

3. Sepah Bank (Landmark)

4. Yazd University (Landmark)
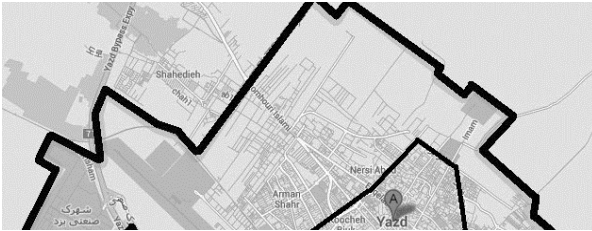

5. Dakhmeh (Tower of Silence) (Landmark)

6. Tak Cinema (Landmark)

7. Illia all (Landmark)

- Node: Strategic spots which enable observer to enter They are considered by people as places to start or terminate a trip (Long, 2007; Taylor, 2009).

8. Atlasi Square (Node)

9.Pjoohesh Intersection (Node)

10. Emam Hasan Square (Node)

11. Transit Stop (Node)

- District: Identified in various scale from medium to large magnitudes. Visible district identified through architecture style, places and so on and invisible district form particular uses (Lynch, 1960).

12. Hostel of Yazd University (District)

- Path: Routes or channels that routinely or potentially moves. Paths are the main physical elements for using in the process of wayfinding and orientation (Lynch, 1960; Long, 2007).

13. Side Walks (Path)

Figure 5 : Physical elements (Source: Field observation)

In terms of identification of the physical elements, the highest percentage belongs to landmarks and nodes of the Safaieh neighborhood which are Yazd University (65%), Dakhmeh (Tower of Silence) (42.6%), Aria Shopping Mall (41.4%), Transit stops (17.2%), Emam Hasan Square (31.3%), and Pajoohesh Intersection (39.2%). Also Atlasi Square as a node received high percentage (56.4%). However, the highest frequency for 'strongly disagree' and 'disagree' was recorded for Sidewalks (29%) which are considered as a path and Transit Stop (24.7% that represent a node. Meanwhile the Ilia shopping mall was rated low, (3.1%) for strongly agree, this can be due to the fact that it cannot be seen from distance (Table 4).

Table 4 : Identification of physical elements of Safaieh-Yazd city

Items	strongly disagree	disagree	neutral	Agree	strongly agree
Hotel Safaieh	13.1	11.1	17.2	27.3	31.3
Shopping mall Ilia	32.3	14.6	40.6	9.4	3.1
Shopping mall Aria	9.1	7.1	17.2	25.3	41.4
Bank Sepah	9.8	18.5	32.6	12.0	27.2
Yazd University	.0	1.0	10.0	24.0	65.0
Dakhmeh	7.9	5.0	19.8	24.8	42.6
Atlasi Square	3.0	3.0	10.9	26.7	56.4
Pajoohesh intersection	6.2	7.2	19.6	27.8	39.2
Emam hasan Square	8.1	4.0	31.3	25.3	31.3
Tak Cinema	10.2	12.2	26.5	17.3	33.7
Sign board	20.7	17.4	34.8	15.2	12.0
Transit stops	20.4	24.7	23.7	14.0	17.2
Sidewalks	29.6	19.8	28.4	11.1	11.1
Hostel	20.0	22.9	31.4	15.7	10.0

The result of mean analysis indicated that the highest mean score belonged to Yazd University (mean=4.50, sd=.83), followed by Dakhmeh (Tower of Silence) (mean=3.89, sd=1.24), then Atlasi Square (mean=4.30, sd=.98), Pajoohesh intersection (mean=3.86, sd=1.19) and the Shopping Mall's Area (mean=3.73, sd=1.44) received highest mean scores in comparison with other elements. This means that people were familiar with the neighborhood which can be due to the length of residency period in Safaieh and some remarkable physical elements as landmarks and nodes were ranked as notable ones. However, sidewalks received the lowest mean score (mean=2.54, sd=1.32). This indicates that as network of path, the streets are not strongly identified, thus resulted in unclear path as sidewalks received lowest score (Table 5).

Table 5 : Mean analysis of physical elements

Items	Mean	Std. Deviation
Hotel Safaieh	3.49	1.42
Shopping mall Ilia	2.30	1.17
Shopping mall Aria	3.73	1.44
Bank Sepah	3.25	1.35
Yazd University	4.50	.83
Dakhmeh (Tower of Silence)	3.89	1.24
Atlasi Square	4.30	.98
Pajoohesh intersection	3.86	1.19
Emam hasan Square	3.64	1.24
Tak Cinema	3.45	1.42
Sign board	2.77	1.30
Transit stops	2.82	1.37
Sidewalks	2.54	1.32
Hostel	2.94	2.32

As among physical elements, landmarks and nodes received the highest percentage so people can easily find their way and use landmarks as sign for their orientation. This causes high level of confidence for sketching map. It is worth mentioning that these results, highlight the landmarks and nodes as significant physical elements. However, due to the unclear paths, districts and edges they cannot guide new comers to find their way. According to Porjafar (2010) Safaieh is designed recently and the importance of physical elements is not equally considered. Although Safaieh has grid pattern, most of residents especially newcomers cannot find their way around (Myrjani and Pedram, 2011). With respect to the questionnaire's results, landmarks and nodes play vital roles in people's wayfinding and orientation. However, edges, paths and districts were not incorporated with people's wayfinding and orientation.

The descriptive analysis of the data revealed that the majority of the participants were males and aged between 18-25 years. In addition, it is identified that among physical elements, landmarks and nodes were highly ranked compared with others. The results from the interviews, highlight and support the results from questionnaire and sketch mapping. The outcomes represent that among five physical elements, landmarks and nodes are incorporated with respondent's wayfinding and orientation in Safaieh neighborhood. Landmarks and nodes were indicated by the majority of those who were interviewed while districts, paths and edges were ambiguous for respondents. Those interviewed indicated that there were no clear elements, signage and direction in neighborhood hence, wayfinding and orientation in Safaieh is difficult.

CONCLUSION

The study was conducted among the residents of the Safaieh neighborhood in Yazd city indicated that landmarks and nodes received the larger score as a successful element, while other physical elements (paths, edges, districts) were not identified as such. This study has shown that although landmark and node were rated as the most recognizable physical elements, these elements are not able to compensate the weaknesses or lack of the other physical elements which means, all physical elements (landmark, node, district, edge, and path) should contribute to create a mental mapping and make wayfinding and orientation easily. Based on the results of this study, it is identified that physical elements had positive effect on people wayfinding and orientation in the neighborhood. Therefore, the enhancement of the physical elements can positively affect the people's wayfinding and orientation. The results of the study clarified the importance of physical elements and psychological aspects to improve the legibility of Safaieh neighborhood in the city of Yazd, Iran. In order to enhance legibility of Safaieh neighborhood, physical elements of the neighborhood should contribute to wayfinding and orientation. Continuous

physical elements should be clearly defined in terms of hierarchical degrees to provide for observer opportunity of differentiating the parts in whole structure.

In order to obtain more accurate results, it is recommended that photo-questionnaire of the physical elements to be utilized in future studies, which can help participants to get the reactions based on reality. Secondly, it is suggested that selecting more than one area and compare them can assist designers to make guidelines in planning process. Finally, as there is a university in this area, most of the participants studied in this college. Hence, they ranked the University as the most significant landmark. Therefore, it would be a good idea to make sure that participants are selected from various groups of people. This would provide better understanding as well as assist planners and designers creating more legible neighborhood by improving the physical elements of the neighborhood.

REFERENCES

Bateson, N. (1984). *Data construction in social surveys:* Allen & Unwin London

Battle, G. andMcCarthy, C. (2001). *Sustainable Ecosystems and the Built Environment: And the Built Environment:* Academy Press.

Bonine, M. E. (1980). Yazd and its hinterland: a central place system of dominance in the central Iranian plateau. *Marburger Geographische Schriften, Marburg Universitat*(83).

Creswell, J. W. (2008). *Research design: Qualitative, quantitative, and mixed methods approaches:* SAGE Publications, Incorporated.

Creswell, J. W. andClark, V. L. P. (2007). *Designing and conducting mixed methods research:* Wiley Online Library.

De Vaus, D. (2001). *Research design in social research:* Sage Publications Limited.

Devlin, A. S. (2001). *Mind and maze: Spatial cognition and environmental behavior:* Praeger Publishers/Greenwood Publishing Group.

Downs, R. M. andStea, D. (1973). Cognitive maps and spatial behavior: Process and products. *Image and environment, 8*(26).

Evans, G. W., Fellows, J., Zorn, M. andDoty, K. (1980). Cognitive mapping and architecture. *Journal of Applied Psychology, 65*(4), 474.

Ewing, R., Clemente, O., Handy, S., Brownson, R. C. andWinston, E. (2005). Measuring urban design qualities related to walkability. *Final Report prepared for Active Living Research, Robert Wood Johnson Foundation*.

Golkar, K. (2000). Constructive elements of urban design quality. *Sofe* (32), 38-65.

Golledge, R. G. andStimson, R. R. J. (1997). *Spatial behavior: A geographic perspective:* The Guilford Press.

Habitat, U. (2001). *The state of the world's cities 2001: Nairobi:* UNCHS.

Kelly, A. andKelly, M. (2001). Building Legible Cities 2. *Bristol: Bristol Cultural Development*.

Lang, J. T. (1987). *Creating architectural theory: The role of the behavioral sciences in environmental design:* Van Nostrand Reinhold New York.

Long, Y. (2007). *The Relationships Between Objective and Subjective Evaluations of the Urban Environment: Space Syntax, Cognitive Maps, and Urban Legibility:* ProQuest.

Long, Y. andBaran, P. K. (2012). Does Intelligibility Affect Place Legibility? Understanding the Relationship Between Objective and Subjective Evaluations of the Urban Environment. *Environment and Behavior,* 44(5), 616-640.

Lynch, K. (1960). *The image of the city* (Vol. 1): MIT press.

Lynch, K. (1981). *A theory of good city form:* HIT Press. Cambridge.

Maslow, A. H. (1943). A theory of human motivation. *Psychological review, 50*(4), 370.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation:* John Wiley & Sons.

Montazerolhojjah, M., Pourjafar, M. andTaghvaee, A. (2012). *Considering Criteria of Landmarks Site Selection and Design through Physical Appraisal of Landmarks Derived from Inhabitants' Cognitive Maps: The Case of Yazd City.* in he 6th International Conference on Design Principles and Practices

Moore, G. T. (1979). Knowing about Environmental Knowing The Current State of Theory and Research on Environmental Cognition. *Environment and behavior, 11*(1), 33-70.

Myrjani, H. andPedram, P. (2011). *Principles of Urban Design, Urban Studies fabric*. Yazd University School of Art and Architecture, Yazd.

Pourjafar, M. (2010). *Urban Signs* (Vol. 1). Tehran: Tahan.

Rapoport, A. (1977). *Human aspects of urban form: Towards a man-environment approach to urban form and design:* Pergamon Press Oxford.

Shamsollahi, B., Selamat, N. H. B. H. andJamaludin, S. S. B. S. (2012). *The Role of Physical Structure Features of Yazd City in Its Urban Identity.* in at the Proceedings of USM-AUT International Conference 2012 Sustainable Economic Development: Policies and Strategies.

Tang, L. (2011). *In Search of an Architectural Legibility: Human Movement Behavior and Wayfinding for Pattern Design*. University of Cincinnati.

Taylor, N. (2009). Legibility and aesthetics in urban design. *Journal of Urban Design, 14*(2), 189-202.

Yaski, O., Portugali, J. andEilam, D. (2012). Traveling in the dark: the legibility of a regular and predictable structure of the environment extends beyond its borders. *Behavioural Brain Research*, 229(1), 74-81.

Yin, R. K. (2009). Case Study Research: Design and Methods (Vol. 5): Sage. Publication.

Yun, Y. W, and Kim, Y. O. (2007). The effect of depth and distance in spatial cognition in Proceedings, 6th International Space Syntax Symposium, Istanbul, 01-14.

Zanganeh Shahraki, S., Sauri, D., Serra, P., Modugno, S., Seifolddini, F. andPourahmad, A. (2011). Urban sprawl pattern and land-use change detection in Yazd, Iran. *Habitat International*, 35(4), 521-528.