



The study of walkability in the central core of Qaemshahr (with the approach of measuring the quality of urban environment from the point of form and body)

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Abstract: *Cities had high walkability in the past and the walking was considered as the main pattern for displacing people inside the bio-centers due to the low cost and easy availability to all segments of society. After the industrial movement and the dominance of cars in cities, the pedestrian was forgotten. As a consequence of air pollution, the policy to reduce the use of personal vehicles and Fossil Fuels, with the approach of urban planning was formed in the last few decades to revive the walkability in the cities. This research aims to measure the quality of urban environment with walkability at the central core of city from the view point of the users in this area. In this regard, the quality of sidewalks has been evaluated from the dimension of the form and body index, which consists of 14 sub-indicators. This research has a combination of documentary and field method in which the framework for the theoretical foundation of research was extracted by studying the theoretical foundation of research at the qualitative section and was used at the quantitative section. The questionnaire method was used for collecting data. Moreover, due to uncertainty about the exact number of population, 384 samples were selected based on Jersey & Morgan Table and were directly questioned by simple random method. SPSS software and the Descriptive and Inferential Statistics Indicators were used to test hypotheses. The results have shown that the qualitative level of form and body in the central core of this city was low and it has been recognized undesirable by the respondents.*

Keywords: *Measuring The Quality of Environment, Walkability, Form-Body Index, The Central Core Of Qaemshahr*

INTRODUCTION

Before industrial revolution, the size and proportion of the city-shaping elements was based on the human scale and the movement pattern was also based on the movement of the pedestrian. It means the pedestrian determines the size and distances (Kahn Lacher, 2011). This kind of movement was experienced for many years and in fact the movement of the pedestrian shaped the structure of settlements. The most beautiful old centers of civilized cities are also evidence of this (Kanaf Lakkar, 2011). Spending leisure time is one of the basic needs of human being like sleeping and food. If this need is responded properly and at the right time, it can leads to spiritual growth, increasing the personal power, and resulting in more efficiency and productivity at work and social vitality and dynamic, and conversely, if not considered and the necessary condition for its

satisfaction is not provided, it will bring disappointment and depression for the community (Kashani joo, 2006). Walking is the most common form of movement and in principle it should be the safest one. However, today the walking is less considered in our cities and this issue has expanded to a point where the nature of pedestrian, as a most important basic of urban transport system, has ruined and the pedestrian has lacked a qualified place at the urban transport system. Moreover, the facilities allocated to the pedestrian system are so insignificant that does not fit to the actual position of urban transport system. Over the last 80 years, the cities of Iran have sharply changed due to the arrival of cars, so that both human and the nature were rejected from the cities. The places of social interaction in the city were reduced. The face-to-face encounters between the citizens have minimized even in the quarter and city scale compared to the past (Yadi Hamedani et al., 2008). Obviously, the current state of pedestrian system, resulted from years of low attention of authorities, planners and designers toward pedestrian system issues, cannot be improved by a simple plan. This plan should necessarily involve all the aspects related to the planning, designing and management of system (Shadab Mehr, 2009).

Problem statement:

Gradual domination of riding on urban places and streets of Iran has kept the urban planning and designing away from the needs of pedestrians and consequently, has decreased the social and cultural values and attractions of urban spaces. Continuing such a trend has caused the civilian life of urban spaces has diminished and got reduced and lacked vitality because of imposing modernization by the government, domination of political sovereignty, and the confrontation of history with tradition and its result as an unfinished modernity (Ghorbani and Jam Kasra, 2009).

The central part of Qaemshahr has a special importance as the primary core of the city. This part has been formed at First Pahlavi era and the buildings and walls of that time are seen at the various parts of this city. The desired area is the cross-point of important urban streets (Tehran Street, Sari Street, Babol Street, Modarres Street, Joybar Street) and the primary formation point of the city. Nowadays, it is the gravity center of urban movement and performance and plays an effective role on continuing and organizing urban life. This area undergoes crises now, resulted from population density and congestion of various applications. The density of residential centers is low and the density of activity centers is high. This area is the primary core and historical center of the city, as it can be seen on the old maps that the main structure of the city was an interconnected collection of open buildings and green spaces that has created a good urban environment and landscape regarding the region's climate and urban designing features, however, in future development open spaces were captured carelessly by other buildings and has created a dense, heterogeneous and fragile set.

Given to that the commercial use is the most dominant use in this region, including various stores and passages located in this area. Commercial units are located compact and with a relatively high density at the range of the square and the streets branched out of it. Many citizens of Qaemshahr City and the countryside go to these units every day and use them. Despite the importance of the central part of Qaemshahr, it seems this city has not good environmental condition. This city has low level of developing pedestrian spaces, the quality of road cover, sidewalks, and the safety. Also, considering to that people go there at many hours of the day, the dominance of cars on the pedestrians is yet very high.

This research aims to assess the quality of urban environment of central core of Qaemshahr City, with the emphasis on the walkability. The main issue in this research is the lack of knowledge and awareness of the possibility for making changes in this part to achieve maximum dynamic.

Theoretical basics and research background:

Basic definitions and concepts:

- **The concept of urban space:**

City is a cultural-physical complex formed based on needs, activities and behaviors of its residents. Humans have personal or group activities depending on their needs and present their special behavioral patterns. The city and its various spaces are the bed for such events. Naturally, the spaces and their characteristics are severely depended on how the users act and behavior. However, this does not mean this is a one-way relation. As the spaces, on one hand, are the full view of activities and behavioral patterns of a society, on the other hand, they have a strong impact on the action and behavior of residents. Thus, urban spaces are part of open and public spaces of the city, considering as the appearance of collective life, that means where the citizens are. The urban space is a scene that the story of collective life begins there (Khademi et al., 2010).

- Kinds of urban spaces:

The urban spaces are of those public spaces in the city that are the context of social interactions and will include three main indices of the urban public scene: being public, open and the social interaction context.

1- The square

The square was the first public scene where people have used for urban spaces. At first, it was arisen at west urbanism by gathering houses around an open area and in front of temples. This arrangement makes the presence of so many worshipers possible at the outer space of temples. However, in the history of Iranian urbanism, the square in front of temple was so small that it does not make the presence of publics at the Religious ceremony impossible. Only aristocrats and gentlemen were allowed to enter into the castle of Persian and Madi. In the history of human civilization, the square has been the most effective urban space for stablishing social interaction and the citizens of historic and modern cities always recognize urban regions from the squares. Squares are spaces for standing and staying, which has developed a similar concept in the realm of public spaces from past to today (Mirza Kouchak Khoshnevis, 2006).

2-street

Street is the result of scattered home accommodation. Based on the path street makes, it allows accessing the center of the "total" square to the individual parts (components). The street has more deep functions than the square. However, the square creates more attraction space for spending more time on human interactions (Mirza Kouchak Khoshnevis, 104, 2006). Streets constitute the main framework, body and structure of a city. In another word, one of the major determinants of each city's form is the street network of that city (Bahreini, 1996).

3- Pedestrian:

A pedestrian is one who uses his/her body directly to do trips. This concept includes peoples who are walking, using wheelchairs, riding skates and so on.

Sidewalk:

Sidewalk is the distance between the roadways distinguished by curbs to the border of building ownership. This kind of space is along with the roadway and has a direct connection with it.

Walking way:

It is a path which is considered merely for pedestrians in which do different activities such as walking, sitting, gathering and rallying, fun and playing, social interaction, meeting, shopping, accessing to traffics and so on. Such spaces are separated from riding space and designed with the least crossroads to the roadways.

The concept of quality:

The "quality" is a word understood intuitively (inwardly) in all art, scientific and industrial majors and continuously applied within the framework of discourse in above domains. It is also a word that is used several times to determine the attraction and superiority of a product (Ahmad shalaby & Associates, 88). The quality normally and in a fully clear meaning is applied for describing "the perfection degree" of objects and phenomena. However, it is difficult to determine what features actually represent "the perfection degree" of a thing (Golkar, 2000). The literal meaning of "Quality" in Persian Language Dictionary Amid is "how, why, the adjective and state of being of something" (Amid, 1984). The literal meaning of the word "quality" in English Dictionary is referred as the nature, kind or the property of an object. This word is derived from the Latin

words of "Qualitas" and "Qualitatis" that means "of one kind" from the French word of "Qualité". The term of "quality" in English means "the thing that a person, a thing or a thought had and make them specialized and interesting" (Oxford Advanced, 1994).

Criteria and indicators effective in the quality of urban environment:

In perception of a phenomenon, there is not only a sense of its status quo, but there are also expectations called space expectations regarding the space. This means that the human expect of specific feelings to emerge in confronting with a special space or place. These expectations can be exemplified as general expectation, subject expectations, case expectations, and topical expectations. Generally, general expectations are expectations that people have of every urban space; namely, people expect the urban space of a beautiful city to have unity, identity, safety and comfort, and make the connection with others possible. On the other hand, the urban environment which can satisfies the expectations of the citizens should have beautifulness, identity, sensational wealth, legibly, permeably, durability and endurance (Tabatabai, 2006).

The concept of environment:

In Persian Language Dictionary Moeini, the term "Mohit" is presented as the space surrounded the place of human life (Moeini, 2006). The geographers, psychologists, social sciences researchers and architectures state different definitions of the environment. But actually, the spaces around is the main standard for different definitions of environment. Thus, each description, definition or presentation of the nature of environment function should be according to the something in the space around (Lang, 2002).

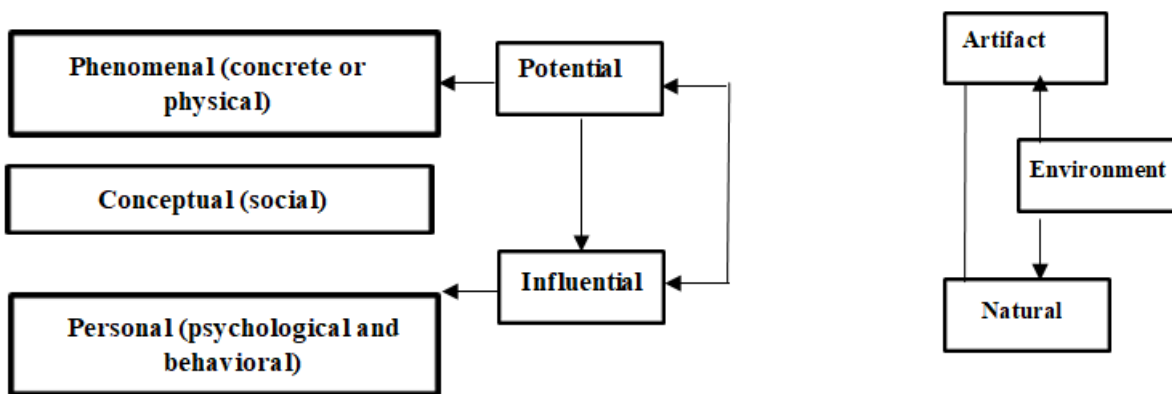


Diagram No. 1-1: types of environment
 Source: Mohammad Reza Pour Ja'far et.al, 2009)

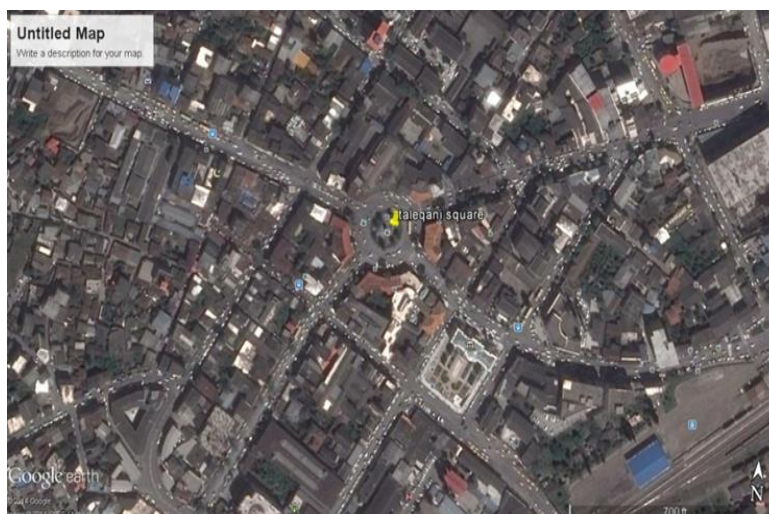
Table 1: summaries of studies conducted on the quality of environment emphasizing on the walkability

Researcher and year	Subject	Results
Rafeian et. al (2010)	Measuring the possibility of quality promotion by building walking road (the central part of Qom)	It is possible to build walking road in this environment to improve the environment quality in the central part of Qom.
Ranger and Raeis Ismaili (2010)	Measuring the quality of the quay (Sepahsalar) pedestrian in Tehran	The quality of this walking road among 7 components of Diversity, Flexibility, Cleanliness, Legibility, form and body, vitality and identity has been at the quality level of low and very low, and 3 components of efficiency, comfort and distinction at the quality level of middle downward and the component of accessibility and permeability at high quality level.
Pour Ja'far et. al (2009)	The effect of organizing visual axes on improving the quality of public	In urban design, in addition to physical and functional goals, the qualitative and mental needs of people in urban

	spaces in the area of Azadi Avenue in Tehran	life environment should be responded such as social identity, security and social welfare, sustainable employment, mental comfort, feeling of beauty, solidarity and social belongings, etc.
Abbas Zadeh & Tamri (2013)	Analyzing the effective components on improving the space quality of walking roads in Tarbiat and Vali'asrstreets of Tabriz	Among qualitative components of walking spaces, the permeability including indexes of accessing and profiting by pedestrian measure, and space communications, provide the highest degree of satisfaction for citizens.
Moeini (2006)	Increasing the walkability, a step towards a more humane city	The degree of walkability in urban spaces is directly depended on the security, palatability and attraction of the environment, accessibility, the cohesion of social cultural issues, and the relationship between user and transportation.
Yadi Hamedani et al. (11 th International Engineering Conference) (2011)	Measuring the quality of urban walking roads for achieving human-centered transportation	Improving the quality of walking roads through diversifying the design of pedestrian traffic areas by suitable urban furniture and increasing the service area, walking width and security can be an essential step for improving the quality of walkways and encouraging people to use non-motorized vehicles for transportation, especially as a pedestrian.
Coleman (1987)	Opportunities for innovation in training the urban design	Qualities in the form of six axes of historical protection and urban restoration, walkway designing, vitality and diversity of use, cultural context and environment, considering to the architectural values of the environment.
Halprin (1968)	A study on the quality, the special character and the meaning of open space in urban design	The priority of walking in urban space, increasing the quality of walking.

Research Scope and Methodology

Qa'emshahr city is located in Mazandaran province, at north of Iran, and in the geographical position 36 ° 29 'north latitude and 52 ° 53' east longitude and 50 m above sea level. This city has been one of the plain areas of Mazandaran and one of the low level lands of this province, but only in low parts of the southeast of the city, it enters the foothill areas of the province. Large study area includes the approximate gravity center of the city and in the intersection of three roads of Qaemshahr - Tehran, Qaemshahr - Babol, and Qaemshahr - Sari. Tehran, Babol and Sari Streets which make this three-way are built on the old ways between these cities. Another street is added to them, connecting Taleqani Square to the Railway square and in general, they create a strong communication link in the city. Valuable buildings placed in this area have given it a historical value. Moreover, important functional placement such as municipality, the office of governor, administrations and banks in these buildings has made them administrative center of city. The building of Razi Hospital in this area is also considered as one of the important center of the city and the placement of the Imamzadeh Yousef Reza within this hospital has given it a religious value (consulting engineers of Naqsh Piramoun, 1999).



Picture 1- the location of central core of Qaemshahr on the satellite photo by Google map 2014



Picture 2- traffic obstacles on the sidewalks, one of the problems in the core of Qaemshahr

This research is given from a research conducted by an academic project and in terms of nature, subject and goals it is an applied research of descriptive-analytic kind. Since questionnaire and interview was used for gathering the required information, so this study can be regarded as a survey research from another point. The required information is collected as both form of documentary (library) and survey. The population includes all people referred to the center of this city, which, due to uncertainty about the exact number of them, 384 samples was selected based on Morgan and Jersey Table by simple random method and directly questioned by using the questionnaire. This study measures the quality of environment from the form and physical dimension, including 14 sub-indexes which the relation between these variables are tested by using SPSS software and utilizing nonparametric test of Binomial Test (Binomial ratio).

Describing the Research Findings

1. In this research, the highest population rate was for men with 59.9 % and women were 40.1%. The results for the respondents' age have shown that more than 73.7 % of them were less than 40 years old.

2. According to data from respondents, 39.6% of visitors to the core of Qaemshahr have B.A degree, and 26 persons, equivalent to 6.8%, was people with the degree under diploma. It should be noted that 36.2% of respondents has diploma and the rest, who are about 64% have academic education.
3. According to data from 384 questionnaires distributed, 133 persons equivalent to 34.6 % are self-employed, most are tradesmen and shopkeepers. Then, due to the placement of multiple administrative buildings such as City council, banks, hospital and so on, 91 employees with 23.7% were the most visitors. Next, the housewives with 20.1% come to this area with various purposes (personal, shopping, administrative affaires) and the least visits have been for physicians with 3.6%. Thus, the central core of this city is commercially and administratively important.
4. According to data from respondents, 128 persons equivalent to 33.3%, were single and 256 persons equal to 66.7% were married. Thus, the married people visit the center of city more than the singles.
5. Given that the central core of city is considered as the most important commercial and administrative center of Qaemshahr, while there is many stores and multi shopping center at the core of the city, the most purpose for visiting the center of the city is for administrative affairs with 28.6% for referring to offices located at the city center. The work place with 21.4% and shopping with 21.1% are respectively the next ratings of the purposes for traffic on the sidewalks of the city center.
6. According to that the central core of Qaemshahr is the place of gathering of many users. More than 38% of people, equal to 148 persons, visit the center of the city twice a day. Given the accumulative percent, more than 80% of people visit the city center at least three times a day.

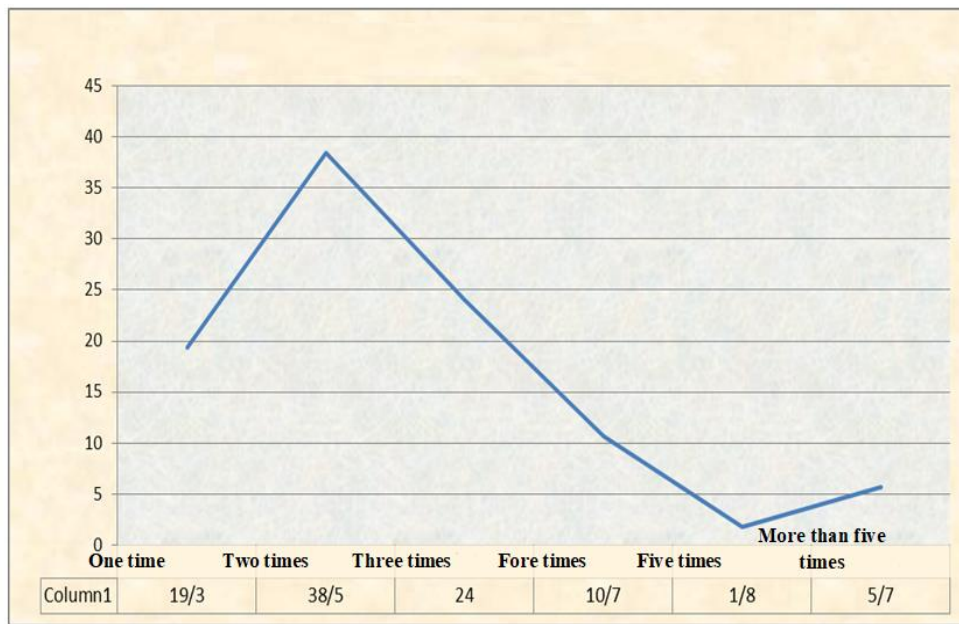


Diagram 1:- Distribution of Frequency of Visits

7. According to data extracted from the questionnaires distributed among the samples, the highest rate is for pedestrians with 39.1% without using any public or personal vehicle. Next, 99 people, equal to 25.8% have used public vehicles (taxi, bus) and the rate of using personal vehicles has been 17.4%.

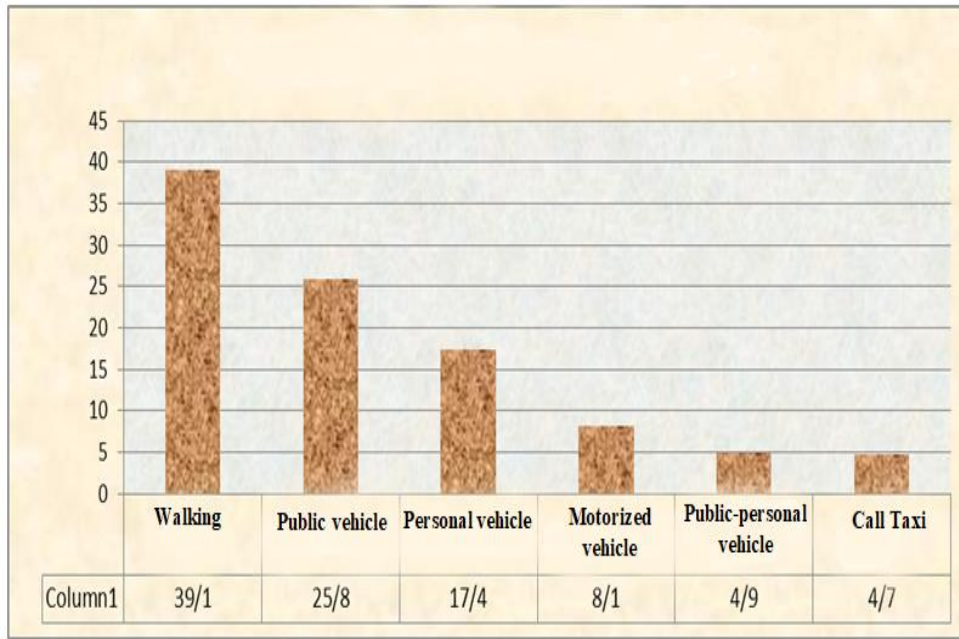


Diagram 2: distribution of frequency of vehicles using by respondents

Discussion and conclusion (testing the hypotheses and analyzing the research findings):
 Assessing the normality of research variables:

Table 2- the results of Kolmogrove-Smirnove test for assessing the normality of data distribution
 One-sample Kolmogrove-Smirnove test

Hypotheses	The main hypothesis: it seems the walking ways are city center are not suitable for walking													
	Control on constructing high buildings at the corner of streets	The width of walking	The quality of color and good materials for flooring sidewalks	Proportion and coordination between the height of buildings	Materials and the view of business units	Shape and color of installed boards	The situation of installed trash bins	Placement and installing Seat for sitting pedestrians	Lightening the sidewalks	The difference in the height of the sidewalk and the roadway	The occupancy of sidewalks	The quality of landscaping, green space	The profit of public green space	The status of this part of city for spending leisure time
N	385	384	384	384	384	384	384	384	384	384	384	384	384	384
Normal Mean	2.69	2.40	2.31	2.53	2.93	2.58	2.03	2.42	2.80	2.79	1.80	1.88	1.86	2.00
Parameters Std. Deviation	0.978	0.996	0.847	0.798	0.924	1.172	1.057	1.011	0.882	0.857	0.830	0.830	0.809	1.052
Most Extreme Absolute	0.221	0.281	0.295	0.289	0.241	0.250	0.234	0.265	0.229	0.312	0.262	0.268	0.243	0.284

Differences	Positive	0.221	0.281	0.295	0.289	0.222	0.190	0.234	0.265	0.229	0.224	0.266	0.268	0.243	0.287
	Negative	-0.170	-0.190	-0.213	-0.193	-0.241	-0.250	-0.165	-0.173	-0.229	-0.312	-0.169	-0.201	-0.202	-0.194
Kolmogorov-Smirnov Z		0.221	0.281	0.295	0.289	0.241	0.250	0.234	0.265	0.229	0.312	0.266	0.268	0.243	0.287
Asymp. Sig. (2 tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

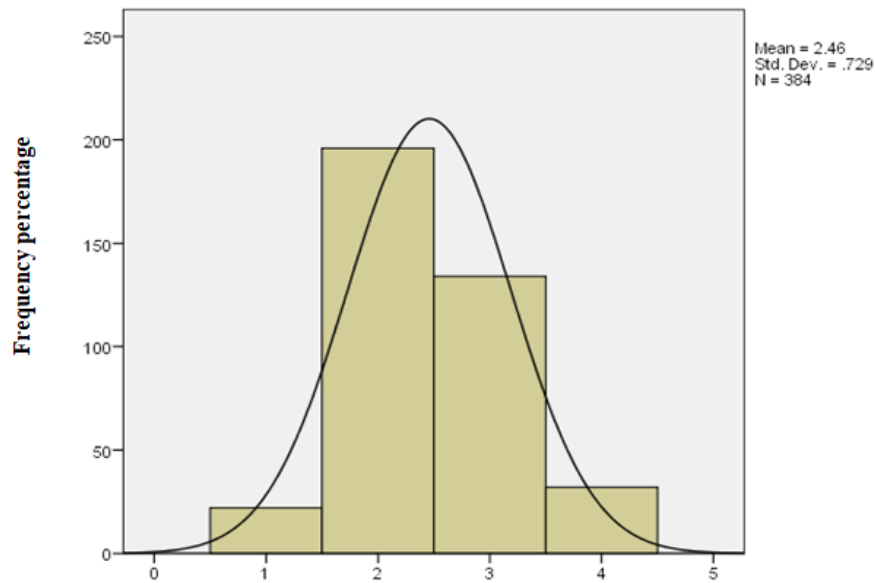


Diagram 3- the distribution of frequency percent of responses to the quality of physic-form components

As it can be seen from the results of table 2, the amount of z in Kolmogrove-Smirnov test for the variable of the main research hypotheses is lowered and the significance level is also lower than permissible error (0.05). Thus, the difference of data distribution in this variable become meaningful with normal distribution and data distribution cannot be assumed normal. For this reason, non-parametric binomial test was used for testing the research hypothesis.

Research hypothesis:

- H0: It seems the status of walking ways of central core of Qaemshahr is desirable based on the quality component of form-body.
- H1: It seems the status of walking ways of central core of Qaemshahr is undesirable based on the quality component of form-body.

Table 3: the results from binomial test to compare the frequency of responses lower than average level with the average responses and higher for the quality component of form-body.

Binomial Test						
		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
The status of walking ways of central core of Qaemshahr is undesirable based on the quality component of form-body	Group 1	<= 3	352	.92	.50	.000a
	Group 2	> 3	32	.08		

	Total		384	1.00		
a. Based on Z Approximation.						

Since the data distribution was not normal, then binomial non-parametric distribution was used for testing the hypothesis. The results of table 3 indicate that the frequency of responses lower than the average has been 352 responses (92%) and the frequency of responses higher than the average level has been 32 or 8%. Given the significance level lowered than 0.05, the frequency difference of two responses groups is significant at 99% level. Thus, the null hypothesis, that the status of walking roads of the central core of city is suitable for walking, is rejected and the Opposite hypothesis (researcher hypothesis), that the status of walking roads of the central core of city is not suitable for walking, is accepted.

The fundamental point in this study has been the priority of respondents to the components of measuring the environmental quality of walking ways that is why Friedman test is used. The results from this test, indicating its data at table 4, have shown that the most chronic and problematic components of form-body are evaluated as unsuitable walking ways due to its occupation with the average of 4.65, lack of public green space with the average of 5.19, non-appropriate landscaping, green space and tree planting along the walking path with the average of 5.35, lack of suitable places for spending leisure time with the average of 5.83, undesirable status of trash bins installed at the walking path with the average of 6.39, inappropriate quality of the color and materials used for flooring the walking ways with the average of 7.79, non-suitable location and installation of chairs for pedestrians along the walking ways with the average of 7.81, narrow walking ways with the average of 8.19, undesirable size, form and color of boards installed at the top of business centers with the average of 8.46, lack of proportion and coordination between the height of buildings around the street with the average of 8.85, non-appropriate control on constructing height buildings at the corner of streets with the average of 9.35, height difference of walking side with the road way with the average of 9.62, undesirable lightening of walking ways with the average of 9.63 and inappropriate quality of materials and façade of business buildings with the average of 10.06.

Table 4- the results of rating Friedman test for "the results of rating Friedman for prioritizing sub-components of form-body quality"

Components	Mean	The average rate of Friedman	Chi Square	Freedom degree	Sig. level
The occupation of walking ways	4.65	1	1078.488	13	0.000
The status of public green space in city center	5.19	2			
The quality of landscaping, green space and tree planting along the walking way	5.35	3			
The status of this part for spending leisure time	5.83	4			
The status of trash bins installed along the walking ways	6.39	5			
The quality of color and appropriate materials for flooring the walk sides	7.79	6			
The location and installation of chairs for pedestrians along the walking ways	7.81	7			
The width of walking ways	8.19	8			
The size, form and color of boards installed at the top of business buildings	8.46	9			
The appropriateness and coordination between the height of buildings around the street	8.85	10			
The control of constructing height buildings at	9.35	11			

the corner of street				
The height difference between the walking way and road way	9.62	12		
The status of lightening walking ways at night	9.63	13		
The quality of materials and fecal of business buildings	10.06	14		

The results from this study with the results of Rafeian et. al (2010), which increasing the functional diversity at different hours of the day will cause to expanding the construct of walking way. Also, walking sides increase the social security for the users of the environment. Moeini (2006) concluded that in urban designing, in addition to form-body purposes, qualitative and mental needs of people in urban living environments such as social identity, social welfare and security, permanent employment, mental relaxation, the feeling of beauty, Solidarity and social belonging and so on should be satisfied. Also, Kokabi et al. (2005) in their research considered the city center as the symbol of the main realm for social interactions and social identity of citizen in addition to its main function and imagined there is a direct and narrow relationship between the city center and spending the leisure time, and its realization in urban centers depends on the attention of urban planners to social and economic, psychological and aesthetic values in the framework of the concept of urban quality of life. This created the impression that walking way is the manifestation of civil life of the city and the place of occurring social events and activities of citizens at urban life. Therefore, the proper design and its expansion cause not only more rich social and cultural life, but also given the urban transportation complexities and issues at Contemporary cities, step forward for solving traffic and transportation problems and leads the cities towards man-made transportation. For this purpose, some suggestions are provided at following.

Suggestions:

Considering to the main purpose of this research, by using the evaluation of visitors ideas about the city center, the following suggestions can enhance its success in the process of accomplishing the program:

- controlling the construction of height buildings at the corner of streets at the center of city
- Providing places for vendors to sell their goods at certain times of the day for preventing the occupation of walking ways by vendors at all hours of day.
- Transforming walking sides to a place for people spending leisure time by constructing Coffees and restaurants that put their tables at a part of walking sides and provide a cozy place for meeting and talking people with each other.
- Providing necessary facilities along the street ending to the city center (Taleqani Square) for walking, resting, meeting and shopping.
- Moving any additional elements such as boards, devices of shopkeepers... from the walking line and widening them for pedestrians use.
- Promoting green spaces, landscaping along the walking way
- Modifying the facades of business buildings, the shape of the showcases, panels and exterior facades
- Coordinating the height of Buildings under construction
- Modifying the urban furniture, including garbage bins on the sidewalks path, and using garbage bins with suitable height, appearance and material that are used by all people of different ages.
- Reforming the shape and color of boards installed at the top of business buildings, which have harmony and coordination.
- Creating an attractive environment by putting suitable seats for resting pedestrians at the walking path

- Lightening the sidewalk by lights with beautiful and proper design in order to increase the security of pedestrians at different hours of the day
- Increasing the public green space at the central core and turning it into a green field
- Eliminating the height difference between the sidewalk and the road way and creating a frontage by green plant with equal height which does not result in loss of vision.

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