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In the Name of God

Dear Readers,

I, on behalf of the editorial board, am proud to present this first issue of the *International Journal of Applied Arts Studies (IJAPAS)* under the sponsorship of the Islamic Azad University, Yazd Branch. We were driven to found the *IJAPAS* by a noticeable lack of journals, in the Islamic Republic of Iran in particular, devoted to architecture, urban design, urban planning, architectural conservation and restoration, painting, art history, graphic, digital arts, fashion design, performing art, industrial design, aesthetics and semantics. Although the academic world is increasingly driven by cross-disciplinary visions and models, we seek multi-disciplinary views, an attempt to inform researchers, graduate students, and professionals about the trends, ideas and innovations being put forward in applied arts. To this end, in addition to standard articles, in every volume of the *IJAPAS* we hope to provide a special issue related to a respective field with innovation.

We are also sending out a call for papers related to *Applied Arts* to appear in the next issue of *IJAPAS* in Nov – Dec 2017. The deadline for submissions for this issue is Oct 31, 2017.

Finally, I should mention that we are committed to a speedy refereeing process for every article submitted to us. We effort to reply to all papers submitted within five weeks' time with a response about acceptance or rejection. We also do not require formatting for submissions in our style until *after* the paper has been accepted by us for publication.

I would like to thank our Editorial Board for their work so far in helping to establish the *IJAPAS*. And, finally, I would like to extend my deepest gratitude to Dr. Ali Boloor, the assistant editor of the *IJAPAS*, for all of his hard work to ensure the timely completion of the first volume.

I am delighted to invite you to visit us at www.ijapas.org.

Sincerely,

Dr. Abolfazl Davodi Roknabadi
Editor-in-Chief
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Regeneration of Distressed Areas of the Central District of Ahvaz City via the Sustainable Development Approach

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Abstract

Central city districts and their old roots in history have high potentials in terms of their geographical centrality, easy accessibility, as well as historical and cultural characteristics. Despite their positive characteristics, those districts suffer from physical problems (e.g., urban distressed fabrics), environmental issues, poor infrastructures, etc. Ahvaz is one of those cities with these characteristics whose urban fabric is distressed and needs strategic plans and executions. The aim is to direct the central district of Ahvaz towards sustainability with strategies and plans based on the sustainable development approach and using systematic vision models. Thus, the issue of regeneration of distressed areas is very significant in this regard.

The research used the random sampling method to select the participants. The research analysis was conducted using Strength, Weakness, Opportunity and Threat, Quantitative Strategic Planning Matrix, Oregon Model and Quality Function Deployment (QFD) model approaches. The study is an applied, descriptive-correlational research. The data were collected via the library research and field study techniques. After analyzing and investigating the data comprehensively, the research offered executive strategies for the success of sustainable development of the study area. The most important strategies obtained from the analysis are constructing green spaces such as green belts in the riverbank of the Karun River, improving the state of paths leading to historical monuments to the tourists' access, and beautifying walls of buildings near the riverbank.

Keywords: Regeneration; Distressed Area; Central District of Ahvaz; Sustainable Development

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1. Introduction

Nowadays the phenomenon of distressed urban areas is considered as a factor for preventing the realization of modern methods of urban management and development. One of the most important consequences of urbanization along with the failure in creating appropriate urban infrastructures for urban residents and migrants is emerging disordered and urban worn-out fabrics around and within cities which result in different social, cultural, economic, and environmental challenges (Teimuri et al. 2010: 2).

Presenting urban sustainable development as the main motto of the third millennium is resulted from effects of cities on the planet and different dimensions of human life. Therefore, with regard to the intrinsic complexity of cities and their different scales of influence, identifying main and key factors of accessing urban sustainability seems necessary (Hosseinzadeh Dalir et al. 2009: 2). Sustainable development is a planned process in which economic development, social justice, and sustainability of environmental resources are emphasized. This process covers all aspects of development based on the improving quality of human life and protecting the environment. Thus, it is referred to as a model integrating social, economic, and environmental purposes (Masnavi, 2003: 9).

In recent literature published over the world, the term "urban regeneration" is a general one covering other concepts such as renewal, regeneration, recreation, and rehabilitation. Urban regeneration is a process resulting generating new urban spaces with keeping main spatial (physical and functional) features. As a result, a new urban space is generated which, in addition to having basic similarities with the old one, exhibits natural and virtual differences with the older space (Zangi Abadi and Moayedfar, 2011: 2).

The central district of Ahvaz City faces many challenges including access and traffic problems, inadequate transportation facilities, population density and overpopulation due to its commercial nature, lack of green space, its early worn-out fabrics due to structural problems caused by the lack of any planning and foresight, and its residents' economic inability. These challenges are against the standards of environmental sustainable development and favorable state of urbanization. The existence of different problems in that area results in the emergence of different challenges for citizens. Therefore, conducting investigations and research seems necessary for obtaining practical solutions for reducing unfavorable effects of those problems. With the aim of directing the central district of Ahvaz City towards sustainability, the present study offers the best strategies and plans via the sustainable development approach and using systematic vision models.

2. Literature Review

The following table shows a summary of the studies which have been conducted on the subject of the present study.

Table 1 Review of literature related to the subject of the study

Author(s)	Title	Results
Steinberg (2012)	Revitalization of historic inner-city areas in Asia (Urban Renewal Potentials in Jakarta, Hanoi and Manila)	Three cities of Jakarta, Hanoi, and Manila were investigated in terms of revitalization policies. As a result, three factors affecting the fate of their urban fabrics were obtained as "sensitivity of managers to the value of urbanization heritage", the amount of budgets and financial ability of urban institutions", and "the

		amount of financial supports of residents of those areas".
Aluko and Gebdgeis (2010)	The Programme of Urban Renewal for Sustainable Urban Development in Nigeria	The study investigates issues and challenges of the city in terms of renewal of urban centers. Researchers believe that appropriately educating and informing people are prioritized for ensuring sustainable urban development.
Ozlem Geuzey (2009)	Urban regeneration and increased competitive power of Ankara in an era of globalization	He investigated strategies of revitalization of distressed areas in Ankara and knows renewal of those areas as a spatial strategy for giving identity for their residents as well as increasing facilities needed by citizens.
Sadan (2006)	Planning of community power	The author considered empowerment as a concept that still needs investigations at extensive levels. She also suggested that presenting better strategies for facilitating performances is necessary.
Lotfi Talesh (2014)	Organizing urban distressed areas; a step towards sustainable development	The researcher believed that organizing distressed urban areas causes improvement in physical development of cities; thus organizing and reconstructing distressed urban areas are effective on economic prosperity and sustainable development of cities.
Rezaei et al. (2013)	Strategic development planning of urban distressed areas	The researchers investigated (physical and functional) distressed indices in Mojahedin Neighborhood of Yazd City and identified activities and land uses cannot fulfill the residents' needs because the physical fabric of the neighborhood has been damaged to a great extent and land uses are heterogeneously constructed. As a result, some strategies for empowering the distressed area of Mojahedin Neighborhood were recommended for better planning and prevention of devastation of its historical buildings.

3. Theoretical Framework

3.1. Concept Definition

Distressed area: Urban distressed area refers to areas belonging to legal city limits which are vulnerable because of physical exhaustion as well as the lack of appropriate enjoyment of railway access, urban facilities, services, and infrastructures. Therefore, they have low spatial, environmental, and economic values. These types of areas cannot renew themselves because of poverty of their owners. In addition, investors do not have the incentive to invest in textures (Jahanshahi, 2003: 61).

Central Business District (CBD): An urban fabric covers a correlated area shaped from different topographies during urban life within city limits and urban fringes in continuation and links with cities. The central district of each city is influential in developing land uses as well as social, economic, and administrative activities of cites via their roles and performances in the fabric texture and appearance of cities. Central districts are considered as the central business district (CBD) of cities overcrowded in days and sparsely populated at nights (Ghanizadeh and Bayat Rostami, 2012: 61).

Urban regeneration: Regeneration means the production of new spatial organizations compatible with new conditions and modern features which are effective in creating new urban communication

or redefinition of old or existing urban communications. The term '*Urban regeneration'* evolved after the Second World War in Europe and Britain, mainly due to post-war decline of industries. Since then, government policies have been focusing on urban regeneration to achieve better society (McDonalds et al., 2009: 50). Thus, urban regeneration refers to a comprehensive and integrated view and a set of measures resulting in solution to urban problems; therefore, it can provide permanent improvement in economic, physical, social, and environmental-regional conditions which have been changed (Roberts and Sykes, 2000: 17).

Sustainable development: It refers to an approach in which improvement in economic, social, cultural, and technological conditions is towards social justice and does not result in polluting the ecosystem and destructing natural resources. Such a development is sustainable that is environmentally non-destructive, technically-physically appropriate, economically durable, and socially acceptable. Coordination and compatibility of these four factors can be considered as indices of sustainable development (Nastaran et al., 2010: 92).

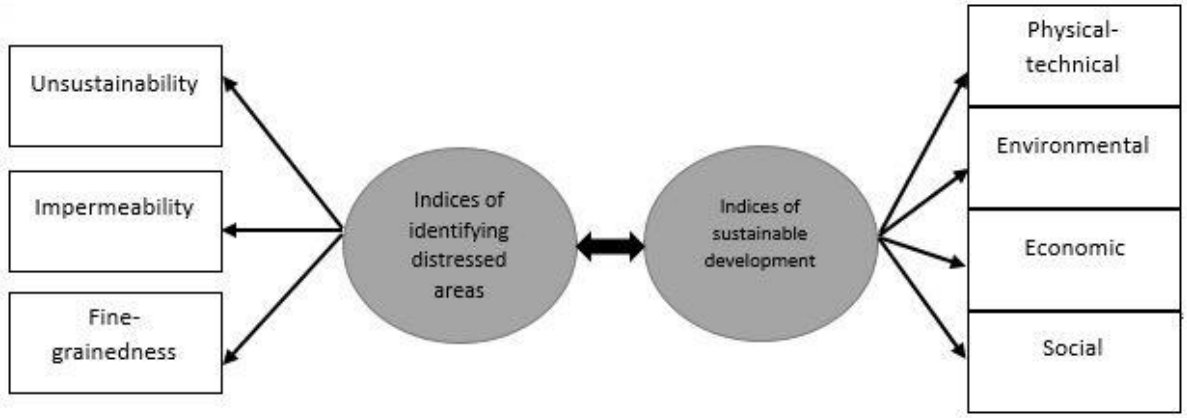

Fig 1 Relationship between indicators of sustainable development and distressed areas

Identification of the Region: Ahvaz is one of the Iranian metropolises and the capital of Khuzestan Province. Geographically, it is situated 31 degrees and 20 minutes north latitude and 48 degrees and 40 minutes east longitude in Khuzestan Plain at 18 meters above the sea level. The area of Ahvaz is 20477 hectares of which 6923 hectares are urban fabrics.

The central district of Ahvaz (the strategic area) reached north the railway and Pol-e-Siah, west Sepah Street and Ahvaz-Khorramshahr railway, south Abareh Street (Fifth Bridge) and Shahid Heidarinejad Street, south-east Bandar Imam Khomeini railway. The central distressed area of Ahvaz city reaches north Razavi road, west Azadegan and the Karun River road, south Abouzar Street, east Behbahani Street. This area is historically the initial core of the growth and development of contemporary Ahvaz. The initial origin and the central area of the city having been expanded around the river in the own historical ground show the consistent, gradual, and continuous formation and evolution.

The present study area covers some parts of zones 1 and 3 including neighborhoods 1, 2, and the CBD of region 1 and all parts of zone 3 including neighborhoods 9 and 11 (Counselling Engineers of Naqsh Piravash, 2006: 7).

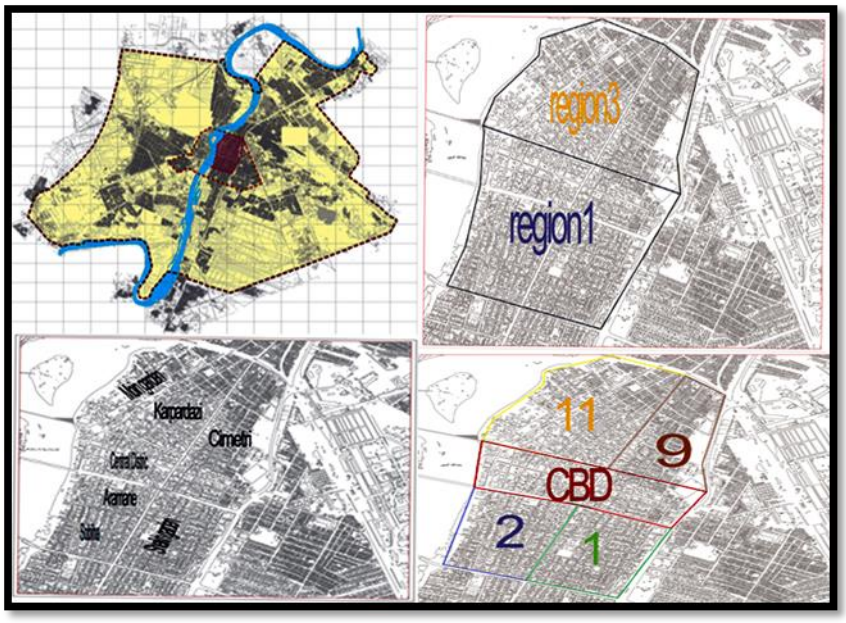

Fig 2 Location and division map of the central distressed area of Ahvaz City

3.2. Situation of Buildings

In the central disstressed area of Ahvaz City, about 26% of the buildings are in acceptable conditions and 39% of them are old and without necessary fortification. More than 63% of the buildings are above 30 years old. This issue indicates that the area is old and distressed.

Table 2 Quality and age features of the distressed buildings in the central distrcit of Ahavz

Quality of buildings		
Indices	**Frequency**	**Percentage**
No quality	402	4.1
Safety	52	0.53
Acceptable	2557	26.01
Restorable	2961	30.22
Old	3824	39
Total	9796	100
Age of buildings		
Indices	**Frequency**	**Percentage**
No life	402	4.1
0-10	1960	20
10-30	1222	12.5
30 and above	6212	63.41
Total	9796	100

3.3. Population Distribution in the Study Area

The relative population density in this area is about 119 people per hectare which is high in density compared to the relative population density of the whole city as 39 people per hectare. This shows the overpopulation in this area.

Table 3 Area, population, and housing indices in Ahvaz City and its central district

Areas	Area (hectare)	Population	Relative population density	Residential unit	Number of households	Household Density in houses
Ahvaz City	20477.1	804980	39.3	135065	147949	1.10
Central district	1034.7	123140	119.0	22445	25666	1.14
Study area	302.3	38548	127.8	7919	8755	1.11
Portion of the central district in the city	5.05	15.30		16.62	17.35	
Portion of study area in the city	1.48	4.80		5.86	5.92	
Portion of the study area in the central district	29.22	31.39		35.28	34.11	

3.4. Economic Situation of Residents of the Study Area

According to the documents of the census in 2006, presenting the residents' economic situation in the study area, 9544 employed individuals and 1083 unemployed jobseekers resided in households of this area. Thus, the active population of these two groups covers 10627 persons. Therefore, the ratio of the active population to the whole area is 27.5%. The highest degree of activity is in neighborhood 2 with 28.7%, and the lowest degree of activity is in the CBD neighborhood as 24.1% (Counselling Engineers of Naqsh Piravash, 2006: 56).

Table 4 Economic data of urban neighborhoods and central district of Ahvaz City

Neighborhoods	Population	Active population	Employed population	Unemployed jobseekers	Degree of activity	Unemployment
Neighborhood 1	10918	3084	2738	346	28.2	11.2
Neighborhood 2	7664	2201	1891	310	28.7	14.1
C.B.D	4845	1167	1081	86	24.1	7.4
Neighborhood 9	6582	1759	1638	121	26.7	6.9
Neighborhood 11	8639	2416	2196	220	28.0	9.1
Total	38648	10627	9544	1083	27.5	10.2

3.5. Identifying Elements and Buildings Enjoying Historical Values in the Distressed Area of the Central District

Historical records and the age of Ahvaz City date back to the old Elamite period in four thousand years BC in Khuzestan. The majesty of the Khuzestan region in the Achaemenid Kingdom, with Shush as its capital, reached its peak. In the late Nasser-al-Din Shah Qajar' period, a small port called Nassei port (at the time of Nezam-ul-Saltana's ruling) beside the broken dam of Ahvaz, Nasseria town, was established which caused the establishment of foundations of the present city of Ahvaz.

The broken dam of Ahvaz as the canonical area of the establishment of Nasseria town (present Ahvaz) was in place of the current suspension bridge (White Bridge). The accumulation of valuable historical monuments indicates the centrality of development and growth of the city from this place. With the development of the city along the Karun River in the south central district of Ahvaz City, a large number of valuable monuments in Mandaeans neighborhood, Armenians neigborhood, Bagh Sheikh neighborhood, and Moein neighborhood are observed. Some of the monuments are Saheb-al-Zaman mosque, Agha Seyyed Ali Dezfuli mosque, Alam-ul-Hoda mosque, Hazrat Ali mosque, remains of Moin-ul-Tojjar caravansary, Afzal house, and Monshi house (Counselling Engineers of Naqsh Piravash, 2006: 110-113).

In the next stages, with the development of the city from the north, buildings such as the Jannat bathroom, the Mahdian balcony, and the Tohid Mosque were built in this area and in the Karpardazi and Moein garden neighborhoods.

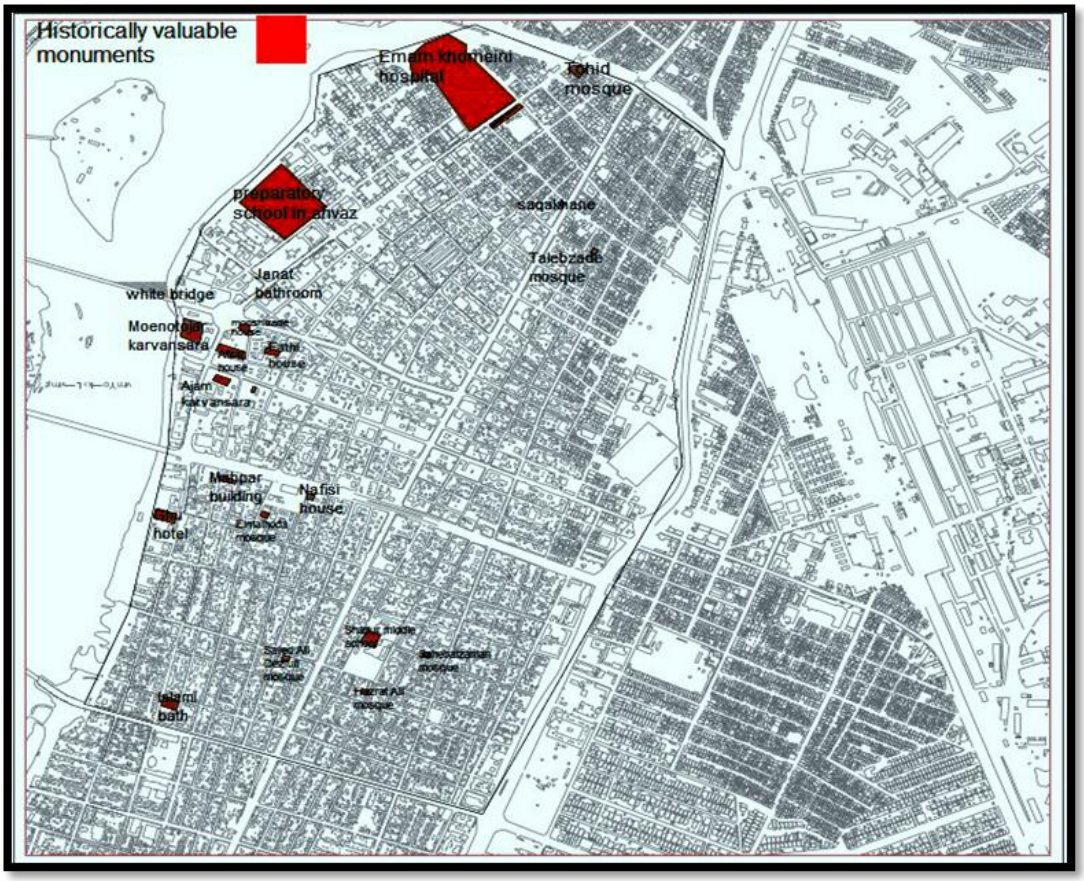

Fig 3 Historical map of valuable monuments

Fig 4 Mahdian balcony

Fig 5 An outdoor

4. Discussion

In this section, weaknesses, strengths, opportunities and threats of economic-social aspects, historical identity and physical-spatial dimensions are investigated for regenerating the distressed area of the central district of Ahvaz City. After illuminating these factors, weaknesses and strengths (i.e., internal factors) are identified in the Internal Factors Evaluation (IFE) Matrix and opportunities and threats (i.e., external factors) are presented in the External Factors Evaluation (EFE) Matrix. To determine the significance coefficient, each factor is given weight coefficient ranging from zero (insignificant) to one (highly significant). Normalization can be used for weighting as well. In this method, the sum of weight coefficients must be equal to one.

To determine the rank of factors, scores ranging from 1 to 4 were considered. Weaknesses and threats were given scores 1 or 2, and strengths and opportunities were given scores as 3 or 4 proportionate to their significance. If the final score is smaller than 2.5, it will indicate the weakness of factors; If it is larger than 2.5, it would be a sign of strength. Internal factors (IFE) and external factors (EFE) as well as scores determined for factors in each dimension are illustrated in tables 5 and 6.

Table 5 Internal Factor Evaluation (IFE) Matrix

Study area	SWOT	Significance coefficient	Rank	Final score
Historical-geographical	Strength			
	S1 Presence of valuable historical monuments in the area	0.045	4	0.18
	S2 Economic boom in the historic area of the city	0.033	3	0.099
	S3 Proper position of the historical core in the vicinity of the Karun river and convenient access	0.043	3	0.129
	S4 Historical records of the CBD	0.033	3	0.099
	S5 Continuity of historical monuments and rows of Abdul-Hamid market	0.033	3	0.099
	S6 Shriati road as the main road connecting to the city	0.043	3	0.129
	Weakness			
	W1 Growth of business activity and high activity loads	0.01	1	0.01

	W2 Distressed area	0.02	2	0.04
	W3 Large part of the CBD with ages over 30 years	0.01	1	0.01
	W4 Lack of complete organization of the riverbank and lack of criterion map in the mechanism of the fabric in the status quo	0.013	1	0.013
	W5 Business boom and further destruction of historical buildings within the CBD	0.01	1	0.01
	W6 Destruction of the valuable monuments around Abdul-Hamid market or their transformation into warehouses	0.02	2	0.04
Economic-social	Strength			
	S7 Ethnic and religious diversity in the area	0.03	3	0.09
	S8 High residency length of a lot of residents	0.03	3	0.09
	S9 High value of land and housing in the area	0.04	4	0.16
	S10 High rate of employment in the central area and multiple job opportunities in this area	0.03	3	0.09
	S11 Residents' sense of belonging to the environment	0.03	3	0.09
	Weakness			
	W7 Low potentiality of the area to attract migrants from other neighborhoods	0.02	2	0.04
	W8 Ownership limitations for renewal	0.011	1	0.011
	W9 Lowering sense of belongingness to the area because of the replacement of residents with lower social layers	0.011	1	0.011
	W10 No cultural spaces in the area	0.011	1	0.011
Physical-spatial	Strength			
	S12 Growth of activity in the CBD and its surrounding areas	0.035	3	0.105
	S13 Growth of the physical construction and renewal of the CBD area	0.033	3	0.099
	S14 Appropriate permeability into some parts of the area due to the existing grid fabric	0.043	3	0.129
	S15 Readability of the area because of differentiation of parts, dimensions, and blocks in the CBD and its surrounding fields	0.033	3	0.099
	S16 More growth in construction of walls and placement of more numbers of grains beside their surrounding passages due to the smaller sizes of the blocks	0.033	3	0.099
	S17 Lowest degree of distressed based on the determined criteria in the CBD area	0.04	4	0.16
	S18 Little distressed based on above criteria in Bagh Moein area in neighborhood 11	0.03	3	0.09
	S19 Continuity of monuments along the rows of the market	0.04	4	0.16

	Weakness			
	W11 Distressed fabric in the immediate walls due to the growth in economic activities	0.022	2	0.044
	W12 Transformation of the fabric to warehouses for business activities in the area	0.011	1	0.011
	W13 Sharp decline in permeability due to microfiber texture and narrow passages inside it	0.011	1	0.011
	W14 Low permeability between fabric and the riverbank of Karun river	0.02	2	0.04
	W15 High distressed in the fine-grained and grid fabric with small blocks in the east of Shariati street, especially in neighborhood 1	0.01	1	0.01
	W16 Weak connections of the area with the northern area because of the passage of the railway	0.011	1	0.011
	W17 Weak connection of the area with the eastern area by passing Behbahani highway with undefined closeness in most parts	0.01	1	0.01
	W18 Whole demolished-restorative-lacking in quality buildings cover about 74% of the whole area	0.02	2	0.04
	W19 According to distressed criteria, 61 blocks out of 453 blocks are among very distressed blocks.	0.032	2	0.064
	W20 Lack of appropriate spatial connection between eastern and western halves of the neighborhood	0.01	1	0.01
	W21 Low quality visual appearance	0.021	2	0.042
Total		1		2.685

Table 6 External Factor Evaluation (EFE) Matrix

Study area	SWOT	Significance coefficient	Rank	Final score
Historical-geographical	Opportunities			
	O1 Possibility of reviving the historical and initial routes of the city in the form of trails for attracting tourists	0.036	3	0.108
	O2 Ability to use historical symbols such as horse-drawn carriages in the area's historical path for restoration of its historical identity and the growth of tourism	0.037	3	0.111
	O3 Possibility of taking advantages of historical buildings and conversion of their land use for restoration of its historical identity	0.045	4	0.18
	O4 Possibility of using traditional pattern of housing for complying them with the climate conditions and the restoration of historical identity	0.035	3	0.105
	O5 Creation of a link between the Karun river and its riverbank for the growth of the CBD area	0.032	3	0.096
	O6 Possibility of reconstruction and renewal of buildings within CBD with regard to the market boom and need for new spaces as well as attentions to the historical fabric	0.033	3	0.099

	and its features			
	O7 Making an appropriate connection between the riverbank of the Karun river and Azadegan Boulevard.	0.042	3	0.126
	Threats			
	T1 Further erosion of historical elements because of the influx of too many commercial activities and supportive functions such as warehouses, etc.	0.025	2	0.05
	T2 Absence of rules and regulations for maintaining historical appearance of the area	0.012	1	0.012
	T3 Presence of activities incompatible with the nature of historical sites and its surrounding fabrics	0.011	1	0.011
Economic-social	Opportunities			
	O8 Diversity of the value of the land and buildings for attracting investors with different financial abilities	0.043	4	0.172
	O9 High focus on services and highness of price of lands in the central area is the factor accelerating the pace of renewal and investment in the sector	0.036	3	0.108
	O10 Potential value added of land and real estate	0.037	3	0.111
	O11 Existence of social capital such as older residents interested in the fabric	0.035	3	0.105
	Threats			
	T 4 Unwillingness of different ethnic groups to live together	0.012	1	0.012
	T5 Failure to attract retail investors for assembly and repair of the historical fabric	0.025	2	0.05
	T 6 Unwillingness for renewal because of the un-economically of the project	0.011	1	0.011
	T7 Low activity rates of women's activities and lack of development of the society due to the lack of their culture of economic and social participation and the absence of suitable job opportunities for this class	0.011	1	0.11
	T8 Increased insecurity in public open spaces due to neglecting lighting of those spaces and the existence of cozy and dark corners in public open spaces	0.02	2	0.04
Physical-spatial	Opportunities			
	O12 Realizing the physical revitalization of the area as a result of business boom and huge demand for land and real estates	0.033	3	0.099
	O13 Possibility of the increase in permeability with regard to small size of the blocks and possibility of widening some passages	0.035	3	0.105
	O14 Increasing permeability of the fabric through the main axes and rows as well as spreading the activities to some parts of the area	0.037	3	0.111
	O15 Possibility to design properly the riverbank of the Karun river because of its location	0.047	4	0.188

	O16 Increasing the connections among the blocks because of the development of activity rows	0.035	3	0.105
	O17 Possibility to increase shading trees in open public spaces	0.039	3	0.117
	O18 Increasing the use of elements such as public outdoor awning to provide suitable climatic conditions	0.035	3	0.105
	O19 Taking advantages of old spaces for constructing parking lots	0.045	4	0.18
	Threats			
	T9 Reduction of connections between designed elements in the fabric because of poor permeability of some parts	0.011	1	0.011
	T10 Problem of fine-grained pieces with different characteristics, reduction in policy-making and control compared to larger pieces	0.011	1	0.011
	T11 Disconnecting blocks by activating walls in the main passages and against distressed blocks inside the fabric	0.025	2	0.05
	T12 Physical destruction as a result of neglecting physical distressed of the fabric	0.023	2	0.046
	T13 Low and limited nature of reconstruction process due to microfiber texture	0.012	1	0.012
	T14 Low resistance of buildings against natural disasters	0.025	2	0.05
	T15 Visual and physical disturbance caused by the excessive concentration of incompatible activities within the fabric	0.025	2	0.05
	T16 Reduction in the quality of residence in surrounding fabrics	0.012	1	0.012
	T17 Access difficulty to all parts	0.011	1	0.012
Total		1	85	2.782

Moreover, integrated strategies can be presented with regard to the matrices. These strategies are given in table 7 by integrating each of the strengths, opportunities, weaknesses or threats.

Table 7 Strategies integrated from SWOT tables

SO Strategies	**WO Strategies**
S1S2S3S4O1O2O3O5O6O18: Restoration of historical elements and signs for economic boom and revival of historical identity of buildings S1S3S4O1O2 increase in the level of environmental interactions with tourists S1S3O1O5O7: Organizing the riverbank of the Karun river for tourists' walkways S8E7 construction of places for pausing, stopping, taking a break and sitting on the margin of sidewalks, public	O5w1: Interventions in commercial as well as mixed zones and passages and complexes for make compatibility, prevention of the spread of influences of activities into other neighborhoods, and increasing the economic strength of the city O7w3: Reduction in the spread of the influence of incompatible activities into the residential fabric for enhancing its vitality O6w3: Preventing the spread of the

space, and historical sites S12S13S14S15S16S19O12O13O14O16: The increase in the permeability of the fabric for stimulating more activity, walls, and the area as well as easier accesses S12S13S15S19O15O17O18O19: Increasing the number of shading trees, urban elements and facilities in public open spaces, commercial rows, historical sites and riverbank of the Karun river S12S13S14O5O6O7O13O15O17: Increasing the width of passages for the formation of marginal green spaces in neighborhood	residential fabric incompatible land uses by creating similar activity rows O1W1: Organizing physical walls of commercial activities within the CBD neighborhood and concentration of activities compatible with each other
ST Strategies	**WT Strategies**
S1T1: Interventions in the field of tourism for improving citizens' quality of life S2T3: Equipping commercial rows with private parking lots S2T4: Widening roads for easy access to fabrics of the central district of the city S8S9S10S11T2T5T6T7: Encouraging domestic and foreign investors to establish centers with compatible land uses S2, S3T6: Allocation of routes for pedestrians' walking along commercial rows and for easing traffic S1T1: Reinforcing tourism and functional activities for promote cultural performance S2T4T5: Widening some passages according to their functions for future development S2S3S5S12T1T3T9: Designing the continuous access network covering all parts of the fabric with an emphasis on pedestrian access	W9W10T2T8: Building the culture for equal treatments with all ethnic and religious groups W1W5T7: Creating job opportunities for women in the central area W8W21T2T5: Encouraging domestic and foreign investors for beautifying the physical walls and creating job opportunities for all social layers W4W13T8T9: Taking advantages of open spaces and perfect lighting in neighborhood for reducing insecurity in the area

Following the calculation of the scores of IFE and EFE matrices, the IFE-EFE diagram can be used for determining the type of the prevailing strategy. This diagram has four parts; according to the obtained scores, the cross-section of strengths and opportunities results in offensive strategy; the confluence of weaknesses and opportunities results in adaptation strategy; the confluence of weaknesses and threats results in defensive strategy; and the confluence of strengths and threats results in contingency strategy.

With regard to figure 6, the confluence of the total IFE-EFE scores on x and y axes results in SO; therefore, external opportunities should be employed using the internal strengths.

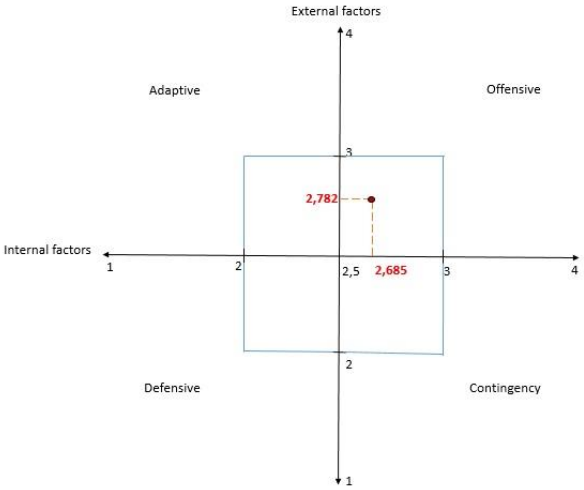

Fig 6 Results of IFE-EFE matrices

4.1. Drawing the Quantitative Strategic Planning Matrix (QSPM)

In this section, with regard to identification of the offensive strategies, their prioritization is required. The QSPM can be employed accordingly. By using this method, the best strategies can be objectively identified. In employing this matrix, analysis of the first phase and results obtained form comparing IFE and EFE factors in the second phase can be used. In the matrix, the first column covers IFE and EFE factors with the data existing in the initial matrices (i.e. significance coefficients and ranks), and in its first row, different strategies are mentioned. There is another column in this matrix in which the attractiveness score is identified, that is whether each factor enjoys a main role in the process of selection of strategies? If the answer is yes, it indicates that the factor has a significant role in selecting strategies in terms of their successes. If the answer is no, the reverse state occurs. The score allocated to attractiveness ranges from 1 to 4, where 1 indicates no attractiveness and 4 indicates high attractiveness. The criterion for evaluating the survey scores was the opinions of experts of planning of Ahvaz city. Scores are presented in table 9. Prioritization strategies are offensive strategies (SO) obtained from table 8.

Table 8 Drawing the Quantitative Strategic Planning Matrix (QSPM) for prioritizing SO

Strategy 1: Restoration of historical elements and signs for economic boom and revival of historical identity of buildings				
Factors		Significant coefficient	Attractiveness score	Final score
	S1 Presence of valuable historical monuments in the area	0.045	4	0.18
	S2 Economic boom in the historic area of the city	0.033	2	0.066
	S3 Proper position of the historical core in the vicinity of the Karun river and convenient access	0.043	3	0.129
	S4 Historical records of the CBD	0.033	4	0.132
	O1 Possibility of reviving historical and initial routes of the city in the form of trails for attracting tourists	0.036	2	0.072

	O2 Ability to use historical symbols such as horse-drawn carriages in the area's historical path for restoration of its historical identity and the growth of tourism	0.037	2	0.074
	O3 Possibility of taking advantages of historical buildings and conversion of their land use for restoration of its historical identity	0.045	3	0.135
	O5 Creation of a link between the Karun river and its riverbank for the growth of the CBD area	0.032	3	0.096
	O6 Possibility of reconstruction and renewal of buildings within the CBD with regard to the market boom and the need for new spaces as well as attentions to the historical fabric and its features	0.033	4	0.132
	O18 Increasing the use of elements such as public outdoor awning to provide suitable climatic conditions	0.035	3	0.105
Total				1.121
Strategy 2: Increase in the level of environmental interactions with tourists				
Factors	S1 Presence of valuable historical monuments in the area	0.045	2	0.09
	S3 Proper position of the historical core in the vicinity of the Karun river and convenient access	0.043	1	0.043
	S4 Historical records of the CBD	0.033	2	0.066
	O1 Possibility of reviving the historical and initial routes of the city in the form of trails for attracting tourists	0.036	3	0.108
	O2 Ability to use historical symbols such as horse-drawn carriages in the area's historical path for restoration of its historical identity and the growth of tourism	0.037	1	0.037
	O3 Possibility of taking advantages of historical buildings and conversion of their land use for restoration of its historical identity	0.045	2	0.09
	O5 Creation of a link between the Karun river and its riverbank for the growth in the CBD area	0.032	4	0.128
	O15 Possibility of properly designing the riverbank of the Karun River because of its location of parts with larger scales along the river's edge	0.047	1	0.047
Total				0.609
Strategy 3: Organizing the riverbank of the Karun river for tourists' walkways				
Factors	S1 Presence of valuable historical monuments in the area	0.045	4	0.18
	S3 Proper position of the historical core in the vicinity of the Karun river and convenient access	0.043	4	0.172
	O1 Possibility of reviving the historical and initial routes of the city in the form of trails for attracting tourists	0.036	4	0.144

	O5 Creation of a link between the Karun river and its riverbank for the growth in the CBD area	0.032	4	0.128
	O7 Making an appropriate connection between the riverbank of the Karun River and Azadegan Boulevard.	0.042	3	0.126
Total				0.75
Strategy 4: Construction of places for pausing, stopping, taking a break and sitting on the margin of sidewalks, public space, and historical sites				
Factors	S8 High residency length of a lot of residents	0.03	3	0.09
	O7 Making an appropriate connection between the riverbank of the Karun river and Azadegan Boulevard.	0.042	4	0.168
Total				0.258
Strategy 5: Increase in the permeability of the fabric for stimulating more activity, walls, and the area as well as easier access				
Factors	S1 Growth of activity in the CBD and its surrounding areas	0.045	2	0.09
	S2 Growth of physical construction and renewal in the CBD	0.033	3	0.066
	S3 Appropriate permeability into some parts of the area due to the existing grid fabric	0.043	4	0.172
	S5 Higher boom in walls and placement of more numbers of grains beside their surrounding passages due to the smaller sizes of the blocks	0.033	3	0.066
	S8 Continuity of historical monuments and rows of Abdul-Hamid market	0.03	4	0.12
	O1 Realizing of physical revitalization of the area as a result of business boom and huge demand for lands and real estates	0.036	3	0.108
	O2 Possibility of the increase in permeability with regard to small size of blocks and possibility of widening some passages	0.037	4	0.148
	O3 Increasing the permeability of the fabric through the main axes and rows as well as spreading the activities to some parts of the area	0.045	4	0.18
	O5 Increasing the connections among the blocks because of the development of activity rows	0.032	4	0.128
Total				1.078
Strategy 6: Increasing the number of shading trees, urban elements and facilities in public open spaces, commercial rows, historical sites and the riverbank of the Karun river				
Factors	S1 Growth of activity in the CBD and its surrounding areas	0.045	2	0.09
	S2 Growth of physical construction and renewal in the CBD	0.033	1	0.033
	S4 Readability of the area because of differentiation of	0.033	2	0.066

	parts, dimensions, and blocks in the center of the CBD and its surrounding fields			
	S8 Continuity of historical monuments and rows of Abdul-Hamid market	0.03	3	0.09
	O4 Possibility of properly designing the riverbank of the Karun river because of its location of parts with larger scales along the river's edge	0.035	3	0.105
	O6 Possibility of increasing the shading trees such as in open public spaces	0.033	4	0.132
	O7 Increasing the use of elements such as public outdoor awning to provide suitable climatic conditions	0.042	2	0.084
	O8 Taking advantages of old spaces for constructing parking lot	0.043	1	0.043
Total				0.643
Strategy 7: Increasing the width of passages for the formation of marginal green spaces in neighborhoods				
	S12 Growth of activity in the CBD and its surrounding areas	0.035	1	0.035
	S13 Growth of physical construction and renewal in the CBD	0.033	3	0.099
	S14 Appropriate permeability into some parts of the area due to the existing grid fabric	0.043	2	0.086
	O5 Creation of a link between the Karun river and its riverbank for the growth of the CBD area	0.032	1	0.032
	O6 Possibility of reconstruction and renewal of buildings within the CBD with regard to the market boom and the need for new spaces as well as attentions to the historical fabric and its features	0.033	4	0.132
	O7 Making an appropriate connection between the riverbank of the Karun river and Azadegan Boulevard.	0.042	2	0.084
	O13 Possibility of the increase in permeability with regard to the small size of blocks and possibility of widening some passages	0.035	3	0.105
	O15 Possibility of properly designing the riverbank of the Karun river because of its location of parts with larger scales along the river's edge	0.047	2	0.094
Factors	O17 Possibility of increasing the shading trees such as in open public spaces	0.039	1	0.039
Total				0.706

4.2. Determining Priorities and Selecting the best Strategy

After evaluating the IFE and EFE matrices and drawing the QSPM, the strategies were evaluated. According to the obtained scores, the strategies can be prioritized.

Table 9 Prioritizing offensive strategies (SO) obtained from the QSPM

Priority	Strategy	Score
1	Restoration of historical elements and signs for economic boom and revival of historical identity of buildings	1.121
2	Increase in the permeability of the fabric for stimulating more activity, walls, and area as well as easier access	1.078
3	Organizing the riverbank of the Karun river for tourists' walkways	0.75
4	Increasing the width of passages for the formation of marginal green spaces in neighborhoods	0.706
5	Increasing the number of shading trees, urban elements and facilities in public open spaces, commercial rows, historical sites and the riverbank of the Karun river	0.623
6	Increase in the level of environmental interactions with tourists	0.609
7	Construction of places for pausing, stopping, taking a break and sitting on the margin of sidewalks, public space, and historical sites	0.258

5. Conclusions and Suggestions for Further Research

The distressed fabric of the central district of Ahvaz City with a concentration of different commercial, service and administrative activities as well as almost all valuable historical monuments has a special significance. Thus, it is subject to overpopulation and traffic as well as rapid changes and transformation in its physical structure. This situation requires a special attention for preserving and reviving values existing in this area and providing proper conditions for appropriate functions of the central district. This part of the city is the origin and destination of daily traffic not only in the city, but also beyond it and even at the provincial level. This issue has resulted in overpopulation, high traffic and pollution.

The significance of this fabric has resulted in overpopulation and distressedness of grains especially due to economic reasons not only in Ahvaz City, but also in the whole region. The negative consequences of this problem are reduction in safety and security, increase in building density, lack of services and infrastructures within the fabric, replacement of native residents with non-native immigrants with different cultures, etc. Although this distressedness is significant particularly in terms of non-resistance of the structure of buildings, the fabric has a distressed view requiring comprehensive reforms and reconstructions.

With regard to their historical identity properties in Ahvaz City, prioritization and attention are required for factors such as high population and traffic, concentration of land uses and activities, poor organization and disturbances in walls, and loss of environmental quality. As a result, the conducted prioritization can be used for providing executive strategies and considerations in line with the sustainable development of the distressed areas of Ahvaz City.

Table 10 Strategies suggested for regeneration of the distressed fabric of the central district of Ahvaz City

Objectives	Strategies	Solutions
Promoting economic efficiency and suitable distribution of economic opportunities	Restoration of historical elements and signs for economic boom and revival of historical identity of buildings	Improvement in the state of paths leading to historical monuments for tourists' access Restoration of valuable elements (tourist attractions) Recruitment of skilled labor forces in the field of tourism for communication with people

		Making hotel-gardens and traditional restaurants Taking advantages of valuable private places as public centers of attracting tourists Increase in the facilities and services in the fabric Improvement and beautification of the historical signs and sites
Easy accessibility and growth in activities	Increase in the permeability of the fabric for stimulating more activity, walls, and the area as well as easier access	Designing entrances of neighborhoods and strengthening community centers Meeting the daily needs of residents of the worn-out fabrics of Ahvaz by goods and services as well as encouraging people to walk Developing compact cities to reduce distances on horseback and on foot Creating attractive, comfortable and safe routes, for walking Constructing walking-based streets for pedestrians an emphasis on the priority of movement Concentering and mixing land uses for minimizing the size of the area and increasing its permeability Providing easy, fast, and safe routes for cyclists' access to goods and services Increasing accesses to make changes in routes and passages, opening and closing different spaces, and increasing the lowest degree of links among them
Enhancing environmental quality and sustainable development	Organizing the riverbank of the Karun river for tourists' walkways	Creating green spaces including green strip along riverbank of the Karun river Lighting along the banks of the Karun River through traditional lighting methods (such as the use of lanterns, etc.) Beautifying buildings walls of buildings in the riverbank. Flooring via paving which enjoys therapeutic aspects Designing elegant and efficient furniture and facilities along the Karun river Legally enhancing tourists' security

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Physical Design of Safe Urban Environment against Environmental Damages in case of Allameh Majlesi Street in Isfahan

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Abstract

Today, one of the main priorities of designers and urban planners is attention to the concept of citizens' security and methods for its enhancement. This is the most important issue to improve the street access network and traffic congestion. As a result, the physical design of Allameh Majlesi Street in Isfahan and its environmental security enhancement are considered crucial in urban space for the welfare of the citizens. This paper has implemented a descriptive-analytic research methodology. The statistical population in this study is all the citizens in the Allameh Majlesi Street of Isfahan. According to Morgan table, 196 people were selected as the study sample. The data collection was through a questionnaire, observations and on-site interviews; decision making was done using the SWOT technique. Three alternative designs were proposed which were evaluated through the AHP technique to select the best alternative. The physical design of safe urban environment against damages was based on criteria to improve the sense of security, utilizing natural elements, environmental quality, and redefining the physical elements. As a result, after evaluating the options, the third alternative was selected based on the index.

Keywords: Urban Space; Security; Environmental Damage; Allameh Majlesi Street; Isfahan

1. Introduction

In today's world, thousands of people get killed or injured by intentional and unintentional accidents every year. People may be at risk when they travel, go to work or go to school, leading to various injuries; they may never return home. These incidents represent the major problems of

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public health and development at international levels that affects people at all ages and social status, but most of the incidents occur to people from low and middle income countries. Nowadays, more attention has to be given to these issues to prevent accidents for which accurate planning is necessary. It is obvious that policy making and implementing urban management should fulfill the need for the safety of citizens as well to provide a suitable ground for growth and to promote safety and security at city levels (Ghalibaf, 2009).

Undoubtedly, the safety problems threaten the hygiene of urban communities in all age groups. Increase in population makes it more probable to increase accidents (Zyari, 2011). Gharee et al. (2010) have investigated and evaluated the sense of security in various urban areas and the results state that the qualitative and quantitative evaluation of physical and social security are necessary within urban spaces. Adibi and Azimi (2011) explain the security of the urban environment based on physical and design parameters. For contemporary issues of urban design, they gave attention to the necessity that human behavior in different places differs in the shape and geometry, and in many cases the space provokes certain human behaviors (e.g. criminal behavior). According to Rahmati and Heidarinezhad (2011), in a study entitled, 'Physical development of cities and necessity to determine safe urban space', safe area in cities will help to address the risks and vulnerabilities. Sadeghzadeh (2015) analyzed the design and improvement of the quality of the physical organization of the urban environment with regard to the community of the blind. He, with respect to the recognition of existing challenges, addressed to the lack of access to spaces due to the disorder of physical space at the Tajrish Square, resulting in lack of communication network at macro-scale as well passages for the blind people (Sadeghzadeh, 2015). Sami (2015) stated that criteria such as permeability and readability are security guaranteed in urban spaces of Dasteban in Mashhad. He also stated that public participation in the urban planning process can improve the current state of Dasheban area (Sami, 2014). Kalantari et al (2013) studied the planning of safe urban spaces based on gender separation with CPTED approach, in the framework of new urbanization theories, and concluded that it could lead to the reduction and prevention of urban crime rate. Daripour and Maleki (2015) showed that sense and identity of place, memorable moments, legibility of environment, general perception, visual pleasure, and the form and shape as urban landscape indicators all contribute to the sense of security of citizens in urban public space. Zanganeh (2015) evaluated pedestrian safety equipment on the streets of Koohdasht city and presented the necessary strategies to increase safety of urban streets and pedestrian crossings to eschew accidents. Kulawiak et al (2013), in a paper, considered security as one of the important factors affecting the quality of urban spaces and stated that high crime rate in open urban spaces around the United States and Europe made it obligatory for urban planners to present physical and cultural solutions for these cities.

Therefore, in light of the findings of previous research, if flourishing and prosperity is the aim, there is a need to get a better understanding of social structures and their impact on people's life and well-being. Improvement of safety is the result of environmental and social factors; hence, it is required to find appropriate solutions to improve the safety of people. In many cases, the type of physical space design, the role of a particular place and social dimensions of an area leads to safe and unsafe spaces (Adibi et al., 2011). As a result, qualitative and quantitative studies are essential for the security of urban space (Ghaeei, 2010). The vital importance of safety and security for any physical space of the city hence needs to be studied.

The accident prevention model for safe society in 1898 was first proposed by Prof. Swannrostrom from Swedish Carolyn University considered as an appropriate model to prevent accidents at county levels, which has been approved by the World Health Organization. Carolyn

University was known as the World Health Organization Collaboration center in disaster prevention and responsible for leading this global movement. The Allameh Majlesi Street is one of the old unique Streets of Isfahan. The importance of urban spaces, especially squares and roads, are due to the occurrence of social interactions. The reason to secure the Allameh Majlesi Street of Isfahan is its dynamism, its role in connecting the mobility of cars and motorcycle, as well as the presence of many pedestrians because of its vitality, lots of shops and presence of an Imamzadeh. Lack of enough attention to the pedestrian areas has culminated in more than 1000 accidents annually and the presence of criminals and homeless people causing psychological and social harms to the society.

2. Methodology

This is an applied research implemented with a descriptive-analytic method. The statistical population consists of all the citizens in Allameh Majlesi Street in Isfahan. Simple random sampling method was used to select 200 individuals among 3000 citizens. Strategies were formulated based on the SWOT technique. According to Morgan's table for statistical population of 3000 individuals, 196 people were selected as the sample population. The data collection was done through a questionnaire in the form of a survey to collect the required information for the analysis. To develop a theoretical base, Persian and English scientific articles related to the study were used. In order to better study the results of the questionnaire, field observations and interviews were conducted using EXCEL software. The SWOT technique was implemented for decision making and three alternative designs were proposed.

3. Findings

3.1. Analysis of the Design Scope (SWOT Technique)

The obtained information and the analyses by the SWOT are presented in table 1; the strengths, weaknesses, opportunities and threats of the area have been evaluated to figure out the strategies and relevant results for a suitable design.

Table 1 SWOT

	Allameh Majlesi Street – SWOT	S	W
		S1: Existence of land use index and population attraction at regional and city scale. S2: Presence of cultural, health, service centers. S3: Easy accessibility to public transport. S4: Presence of legible cognitive image along the street. S5: Presence of historical elements and organic texture of the street. S6: Existence of structure and places as historical and time indication of the	W1: Physical and activity worn-out in the Allameh Majlesi Street texture. W2: Existence of narrow passage in many parts of the area. W3: No area for spending leisure time and resting place. W4: The inappropriate width of the street and the absence of speed breakers along the route. W5: There is no proper parking lot that causes vehicular parking at the entrance of the street or double parking and this has caused disturbance in traffic. W6: Unplanned and inappropriate bridges.

		area. S7: Smooth path surface. S8: Skyline harmony.	W7: Unmanaged pedestrian and bicycle tracks. W8: Functional bans for the disabled. W9: Difference in surface and failure in the floor. W10: No proper use of facilities.
O	O1: Ability to use abandoned spaces for level parking. O2: Ability to create amenities and equipment on the streets for pedestrians. O3: Organizing how to navigate through the passageways and using appropriate physical design in the area can reduce the penetration of sound pollution in the area. O4: Presence of historical elements is an opportunity to create a hub for tourism. O5: Designing special tracks for bicycles and motorbikes can improve security.	- Use of appropriate facilities and lighting and upgrading the quality of the streets. - Surface design and walls in order to satisfy people. - To limit the traffic flow in certain areas.	- Creating motivation for people alongside the design of street. - Creating unity and empathy among people in the area to collaborate in street design. - Construction of parking lots around the streets.
T	T1: Destruction and reducing the visual quality of the worn-out area in case of failure to address the condition of the buildings. T2: Not paying attention to the needs of residents and pedestrian. T3: Risk of dumping waste in public and pedestrian areas. T4: Gradual degradation of valuable structures. T5: Destruction of the proper face of the historical texture. T6: Presence of barrier for the commuters. T7: Unsafe pedestrian for the disabled people.	- Due to lack of management and lack of accessibility to the physical form of the street one witness the decline of the street identity and security. - Strengthening the pedestrian network for the people.	- Training to raise people's awareness in relation to physical design of urban space against environmental damages.

3.2. Evaluating SWOT table and Extracting a General Strategy

Each of the norms present in strengths, weaknesses, opportunities and threats according to the design approach by ten experts (i.e., professors, municipal experts and urban design engineers), evaluated on a scale of 4 to 9 and the values were normalized. After multiplying the coefficients in the number of passages, the total sum of the values of each strength, weakness, opportunity and threat was obtained. Finally, according to the analysis of the norms in the study area, the result is an aggressive strategy which is shown in table 2.

Table 2 Valuation result

Internal environment			
Weaknesses 2.63	Strengths 4.26		
Adaptive strategy (minimum-maximum)	Aggressive strategy (Max-max)	Opportunities 3.97	External environment
Defensive strategy (Minimum-minimum)	Contingency strategy (Maximum-minimum)	threats 1.16	

3.3. Objectives, Strategy, Policy

Table 2 SWOT Analysis

Objective	Strategy	Policy
Enhance the sense of security within the area.	Enhance cognitive permeability for site users	• Improved lighting quality in the area • Surface design for all users of the site, including the disabled and the blind • Increased control and monitoring • Change in the texture at the same time with incident that happens within. • Creating signage, landmark and symptoms to encourage continued movement.
The use of natural elements in the area.	The use of natural elements along the street	• Restore vegetation texture. • The use of pots along the axis also adds to the beauty aspect, as well as to prevent the vehicle from entering the walkway.
Environmental quality	Upgrading the priority of pedestrian access than to the ride.	• Separation of the riding path from the pedestrian. • Change the materials used for flooring • Limit the vehicular travel time to the desired area • Avoiding the use of fixed facilities
Re-defining physical elements in the area.		• Creating harmony and increasing visual proportion of the street wall by using consonant colors, eliminating visual disturbances such as cooling channels, creating harmony in panels and canopies • Use suitable paving stones in terms of materials and colors, especially in areas where the route changes.

4. Analysis of the Questionnaire

The results of the analysis of the questionnaire shows that among 250 respondents, there was a need for 15 percent lighting, 55 percent of wall design, 55 percent surface design, 50 percent reduction of traffic, 65 percent separation of the pedestrian path from the bicycle and motorbikes and 10 percent increase of supervision.

4.1. Probable Scenario

In this scenario, because of public dis-satisfaction there is a probability that the Allameh Majlesi Street might be empty; buildings are destroyed causing damage to the appearance of the street. The

aesthetic aspects of the street are affected by the amenities of the shops placed on the pavement area. Another problem is double parking due to lack of parking lot, causing traffic congestion; this results in the inconvenience for pedestrian commuters as motorcycles pass through the footpath. In summary, the street beauty and dynamism are completely eliminated due to the high density and crowd along the pathway.

4.2. Preferred Scenario

The preferred scenario leads to the dynamic Allameh Majlesi Street where people walk on the pedestrian area and do window shopping. The stone pavements are designed and children are running along the sidewalk. Advertising places are allotted on the street walls, and all the information is electronically displayed. A number of buildings in the area are converted into parking lots resulting in traffic reduction. Even on certain days, private car entry to the area is prohibited, due to "a day without a car" regulation, and one could move around the street with means of public transportation. Motorcycle and bicycle tracks are made along the street, and inside the pedestrian areas there are flower boxes that prevent the vehicles' passing.

The uniformity in the shops' design and decoration give an aesthetical view along the route; there are benches along the sidewalk for short time rest. Presence of lots of trash bins causes the cleanliness of the route, and people move more willingly and enthusiastically on the street. Appropriate night street lightings make it a nice and appeasing place to walk and provide security for the pedestrians.

4.3. Framework

Table 4 Proposed framework for the formation of the Allameh Majlesi landscape statement based on Tehran model.

Landscape Statement Framework			The landscape of Alamah Majlesi neighborhood
Supporting tips	Meaning	Implied meaning	Allameh Majlesi Street is the heart of the physical and environmental security of the city of Isfahan
		Explicit meaning	Economic base: The city's historic religious axis
Details	Identity	Economic morphology	Use of the commercial center and economic tourism activities
		Socio-cultural morphology	Perfect place to spend leisure time, life and religious education
		Economic morphology	Inspired by the traditional texture of Isfahan and tourist sites
	Structure	Local status	Tourism destination on national-regional scale
		National status	
		Regional – international status	

4.4. Statement of Vision

Allameh Majlesi Street is the heart of the physical security and economic axis of Isfahan; in addition to its national grandeur, it has a brilliant niche at a regional level. Implementing well-established programs, boosting strong partnerships among people and authorities, the use of

business centers and economic-tourism activities as well as the historical-religious hubs, the elite organizations and tombs of Allameh Majlesi can all prove very effective in attracting domestic and foreign tourists; it can even attract residents to continue their lives there, and restore vitality and prosperity to the street. Such physical designs, the restoration of environmental safety, and the reduction of traffic all would solve the problems and improve the living conditions. This attempt might bring vitality to the street and accommodate many residents. Creating green space is also necessary to encourage people to spend their leisure time and social interactions there; this would enhance the dynamism and vitality of the area. Existence of precious historical arts and religious ceremonies in the region will make it possible to turn this area into a historic-touristic hub at a national-regional level.

5. Design

According to the studies carried out and the introduced indicators, the alternatives are presented; in order to achieve the best option, three alternatives have been proposed which are alternative zero, minimum and maximum.

5.1. Alternative 1 (zero)

In this alternative, the status quo is completely simulated and all the features are specified. In this, the street problems are studied in such a way that flooring, street walls and shops are examined.

According to the current design, the stone floorings of the pavement area are similarly un-organized and at places unsuitable for people. The security for the pedestrians is endangered as vehicles enter the sidewalks. The flowers are without safe railing protection.

Fig 1 Alternative zero

5.2. Alternative 2 (minimum)

In this alternative, changes have taken place to a minimum level. Amenities embedded such as benches, secure space such as resting places for elderly and disabled people, separate bicycle and motorbike lanes from the sidewalk and some lighting are provided.

Fig 2 Alternative 2 (minimum)

5.3. Alternative 3 (maximum)

In this alternative, a new design has been applied in accordance to the studied criteria. The design proposes equipment for people on the street, temporary resting space for elderly and disabled people, built-in benches, restoration of green texture and providing necessary street lighting.

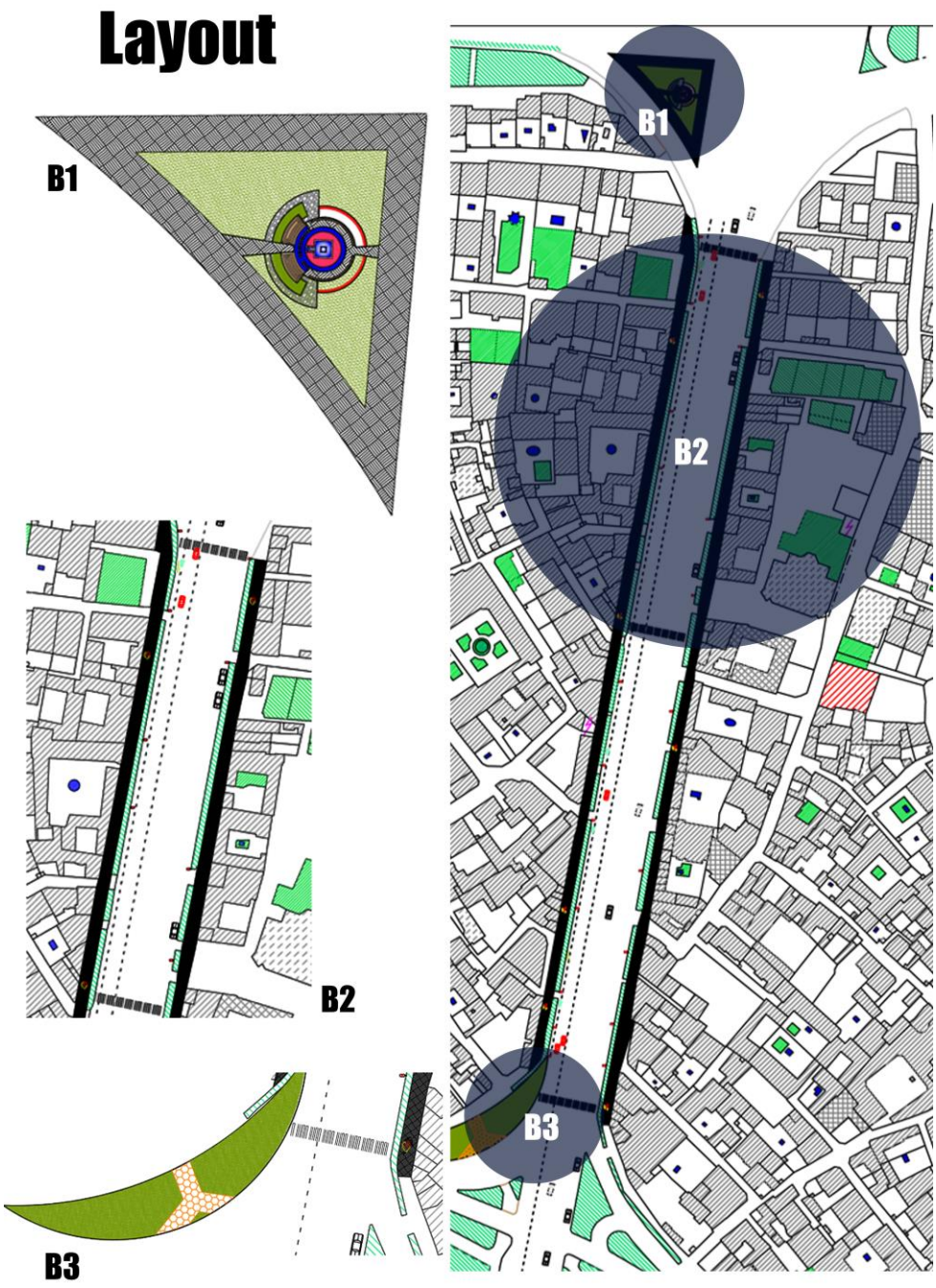


Fig 3 Alternative 3 (maximum)

6. Evaluation of Alternatives by AHP Technique

In evaluating the alternatives, the criteria that are considered are a) enhancing the sense of security, b) sustainable life, c) environmental quality, d) redefining the physical elements in the area.

- Four matrix assessment criteria
- First squaring each row, and then normalizing them.

Table 5 Valuation of criteria

	Enhancing the sense of security	Sustainable life	Environmental quality	Redefining the physical elements in the area
Enhance the sense of security	1	5	7	3
Sustainable life	1/5	1	3	7
Environmental quality	1/7	1/3	1	5
Redefining the physical elements in the area	1/3	1/7	1/5	1

Enhance the sense of security $\Rightarrow \sqrt[4]{1\ X\ 5\ X\ 7\ X\ 3} = 3.2 \rightarrow \frac{3.2}{16} = 0.2$

Sustainable life $\Rightarrow \sqrt[4]{\frac{1}{5} X\ 1\ X\ 3\ X\ 7} = 1.43 \rightarrow \frac{\frac{1}{43}}{\frac{11}{2}} = 0.12$

Environmental quality $\Rightarrow \sqrt[4]{\frac{1}{7} X\ \frac{1}{3} X\ 1\ X\ 5} = 0.69 \rightarrow \frac{\frac{0.0}{69}}{\frac{6}{47}} = 0.1$

Redefining physical elements in the area

$\rightarrow \sqrt[4]{1/3\ \text{X}\ 1/5\ \text{X}\ 1/7\ \text{X}\ 1} = 0.13 \rightarrow 0.13/1.67 = 0.18$

Evaluation of the sub-criteria within the criteria
1. Sub-criteria to enhance the sense of security
a) Quality of lighting, b) increasing supervision, c) reducing anomalies backgrounds
2. Sub-criteria of environmental quality
a) Separation of vehicular movement from pedestrian areas, b) width of the sidewalk, c) facilities and equipment of the city
3. Sub-criteria of redefining the physical elements of the area
a) Visual proportion, b) reduced disturbance, c) appropriate lighting
Evaluation of alternative of 1, 2 and 3 relative to the sub-criteria
1. Sub-criteria to promote security criteria
a) Quality of lighting, b) increasing supervision, c) reducing anomalies backgrounds
2. Sub-criteria for sustainable life criteria
a) Identity, b) dynamic, c) diversity
3. Sub-criteria for environmental quality criteria
a) Separation of vehicular movement from pedestrian area, b) width of the sidewalk, c) facilities and equipment of the city
4. Sub-criteria for redefining physical elements of the area
a) Visual proportion, b) reduced disturbance, c) appropriate lighting

Table 6 Sub-criteria evaluation of reduction of anomalies fields

Criterion	Enhance the sense of security			Sustainable life			Environmental quality			Redefining the physical elements of the area		
	Quality of Lighting	Increased monitoring	Reducing anomalies background	Identity	Dynamics	Variety	Facilities & equipment of the city	Width of the sidewalk	Supervision of the vehicular traffic	Appropriate lighting	Visual proportions	Reduce disturbances
Alternative 1	0.18	0.18	0.18	0.1	0.1	0.1	0.12	0.12	0.12	0.2	0.2	0.2
	0.18	0.26	0.25	0.26	0.18	0.25	0.26	0.23	0.27	0.22	0.15	0.27
	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	0.0077	0.0112	0.0108	0.0062	0.0043	0.006	0.0074	0.0066	0.0077	0.0105	0.0129	0.0129
Alternative 2	0.18	0.18	0.18	0.1	0.1	0.1	0.12	0.12	0.12	0.2	0.2	0.2
	0.18	0.26	0.25	0.26	0.18	0.25	0.26	0.23	0.27	0.22	0.15	0.27
	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

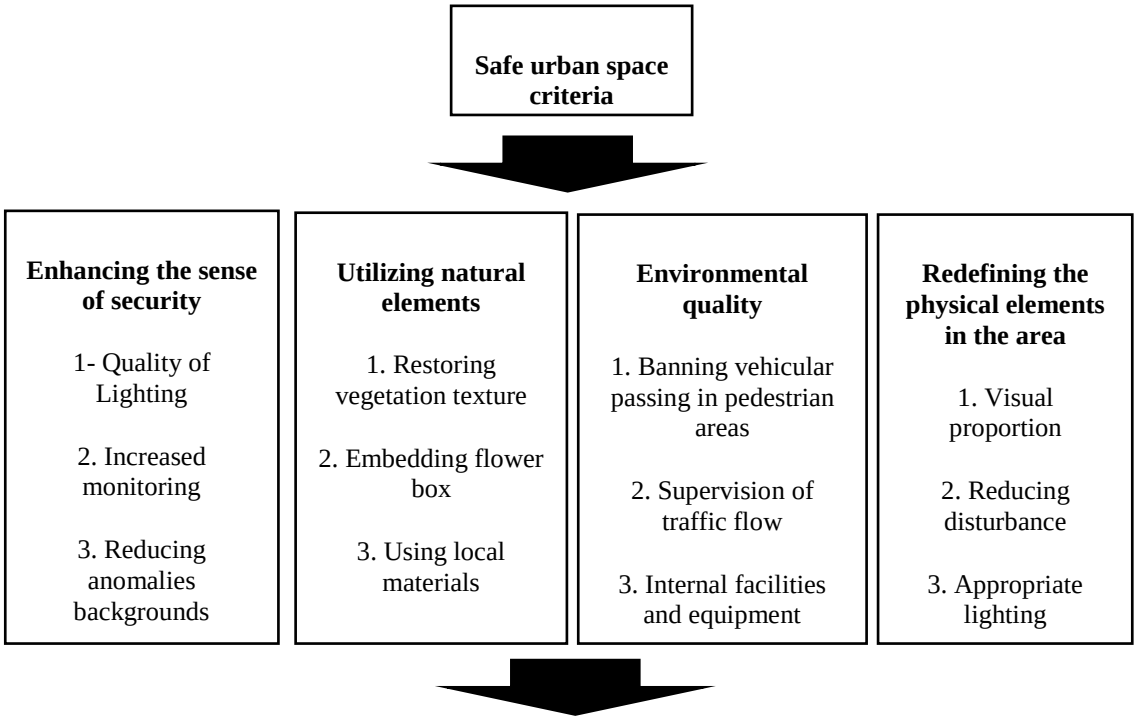
	0.0064	0.0093	0.009	0.0052	0.0036	0.005	0.0062	0.0055	0.0064	0.0088	0.006	0.0108
Alternative 3	0.18	0.18	0.18	0.1	0.1	0.1	0.12	0.12	0.12	0.2	0.2	0.2
	0.18	0.26	0.25	0.26	0.18	0.25	0.26	0.23	0.27	0.22	0.15	0.27
	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	0.0081	0.0117	0.0112	0.0065	0.0045	0.0062	0.0078	0.0069	0.011	0.0088	0.0075	0.0135

Table 7 Scoring the alternatives

Scoring Alternatives	Alternative 1	Alternative 2	Alternative 3
	6.24×10^{-24}	7.38×10^{-23}	8.04×10^{-34}

After analyzing all the alternatives, scoring the criteria and evaluating each alternative with the sub-criteria, the third alternative was eventually selected as the best option.

7. Analysis and study of the final alternative in accordance to the safe urban space



The implementation of a safe physical design of urban space against environmental damages was made possible based on the mentioned criteria. By increasing the supervision and reducing the anomalies against damages, a design was proposed to construct standard bridges, facilities and equipment to prevent physical damages to the street users. Considering the subject of the study, it was an important issue to prevent the entry of vehicles into the pedestrian areas which was achieved via incorporating flower boxes and barriers and changing the pavement surface materials.

8. Conclusion

Nowadays, special attention has been given to security in cities. Therefore, to secure the city some areas were studied. According to SWOT table and the scenarios, to attract people and to create physical security, it is necessary to separate the motorcycle and bicycle lanes from the

pedestrian area and to design the flooring and street walls. Proper lighting at night and more monitoring and patrolling would restore security to the region.

After analyzing all the alternatives through the required techniques, valuing the criteria and evaluating alternatives with the sub-criteria, the third alternative was selected. Therefore, in order to improve the conditions and provide more security it is proposed to;

- Expand the street to add motorbike and bicycle lanes.
- Limit the vehicular movement to reduce traffic.
- Establish parking lots near the surrounding street to reduce traffic congestion.
- Change the stone flooring materials of the pedestrian area with regard to the user needs including disabled and blind people.
- Use flower boxes to increase the aesthetic aspects and to serve as an obstacle for the vehicles to enter the pedestrian area.
- Provide temporary short time resting space.
- Construct speed bumps and ramps.
- Improve the lighting quality especially in insecure and dangerous places.
- Create harmony and increase visual proportion of the street wall using consonant colors.
- Eliminate visual disturbances such as cooler channels and create harmony in panels and canopies.
- Design mechanized panels to provide information in the streets.
- Avoid the use of non-removable facilities.

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Explaining the Principle of Semi-Public Transition Space Formation in the Neighborhood Spatial Organization

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Abstract

Space is the key element in designing and dealing with urban places. Throughout history, urban space has been an integral part of cities' physical organization and functional condition of the variables. However, during the past years, the neighborhood spatial organization has included a wide range of private and public spaces linked together in spatial hierarchy. But nowadays, eliminating spatial hierarchy is one of the urban issues regarded as semi-public space (i.e., transition spaces between public and private) as well the disappearance of the space connectivity. Hence, when a person departs from his/her house, the moment the door closes behind, he is isolated from the world that he belongs to since there is no continuity or readiness for the person to depart from private space and enter the crowded urban space. This needs preparedness which in urban space design is created by observing and applying a set of principles generally contributing to the quality that stimulates human senses in the neighborhood. In today's urban spatial organization, ignoring these valuable principles of spatial design creates a neighborhood without transitional spaces. Applying a descriptive method, this study explains the principle of semi-public transition spaces achieved through the following four principles of spatial hierarchy, i.e., rhythm, privacy, territory and heterogenics of space in the neighborhood. Applying these principles in design leads to the establishment of intermediate and semi-public spaces in the neighborhood's spatial organization as the aim of urban design is to improve the quality of environment.

Keywords: Design Principles; Semi-Public Space; Transition Space; Spatial Hierarchy; Privacy and Territory; Space Contrast; Spatial Rhythm

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1. Introduction

Today, undesirable experience of urban space design leads to inconsistency and confusion of space organization in the cities. Why are the principles and policies of space designing ignored? This principle over centuries has always been constant and has served as the stability and sustainability of the cities. The principles based on experience and time in traditional cities and in accordance to human needs either consciously or unconsciously have shaped our cities. The urban spaces, as part of cities, were not an exception from these principles of formation. This study aims to explain the principle of forming the semi-public spaces (i.e., space in the old cities and historical textures connecting public and private spaces and establishing the transition areas between public and private), and lays emphasis on the valuable role of these spaces and the need to remind designers to review design and the inclusion of these spaces in neighborhood spatial organization. In this regard, principles of urban design by Tavassoli are used as the fundamental principles in order to analyze the principle of forming semi-public transition spaces.

2. Concept of Semi-Public Space in Relation to Transition Space

Semi-public spaces are those spaces in city that, due to objective limitations, are used by a particular group of people (Pakzad, 2008: 77). These spaces include range, location and urban spaces relatively proposed for certain people. For example, in the old semi-public space, a place specified as dead-end or a porch was accessible to several houses. These spaces were the territory to several housing units or neighborhood or without private property ownership. The entry to this space was not on one's desire but had terms and conditions. The features of this space had an index to choose among the general public. This index was age, gender and work. In other words, these spaces were selected and designed for a specific class of people. Some experts differentiate semi-public and semi-private spaces with details.

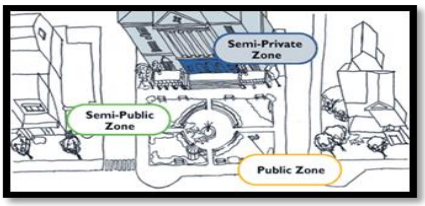

Fig 1 Separating public areas – semi-public-private areas (source: www.flickr.com)

It must be legally considered that private and public places as related to how the space is used. The meaning of space domination has a role in defining private or public space. Some spaces present in the city have private ownership. This group because of private use is excluded from the public space discussion. Other categories of spaces are publicly owned. These spaces have the potential to be part of public spaces. These recent space depending on their usage move in the range of semi-private and semi-public spaces, and it is not necessary that all public spaces in urban privacy have a degree of public (Pakzad, 200۸:77). Hence, it can be said that urban open spaces in terms of space ownership are classified into public, semi-public, private and semi-private spaces. In case of popularity of a place, it is not an issue about who owns it. It is a matter of public life that makes sense (Tonkis, 2009: 104). In urban design, semi-public transition spaces are urban spaces due to their features known as transition space and level of performance remembered as semi-public spaces. In the review of the city as a living system, unit and complex in different socio-spatial dimensions and not just the physical aspect, four spatial dimensional measures of socio-spatial analysis have been considered. This scale is a tool to understand the complex layers that

includes human, mass and space. The scale includes body, home, neighborhood and city which show the social communication in space making the nature of life and social human being in context to urban environment (Madanipour, ۲۰۰۹: 13). The sequence of abstract and objective measures shows that neighborhood is the bridge between home and city. What enables this relationship is its physical space and this connecting space is the transition space providing the possibility for the residents to pass through these spaces from home to neighborhood environment. The perception of residential person from their resident and city happens step by step and the person at once does not enter the public and crowded space of the city.

3. Principles of Urban Design

Urban design principle is producing harmony and connecting with the urban spaces. This has an impact on how one may replace the urban elements originated from the demands and needs of people. For example, the principle of family privacy through central courtyard in old house or the principle of social gathering in the center of neighborhood and the concept of neighborhood life might be dealt with. It should be noted that when talking about principles, it is not about the author and other expert opinions but about the rules that are the experience achieved centuries ago and were considered in design. Tavassoli, in a study on the cities of Iran, developed some principles of organizing the urban spaces. Some of these principles include: principle of interior-exterior space, interconnectedness of urban element and residential units, enclosed space, scale and proportion, contrasting spaces, territory, composition and space awareness.

4. Principles Forming Semi-Public Transition Spaces

4.1. Principle of Hierarchy of Urban Spaces

The most important and fundamental rule in the formation of semi-public spaces is the principle of hierarchy. This is the basic principle governing the collection and component of the phenomena that either exist as natural in the universe or created by human. The hierarchy principle plays a crucial role in defining components and provides identity and distinguishes them from other elements. In other words, this principle is one of the criteria that play a key role in defining the order of governing the collection, relationship between the components, and relationship between each of the components with entire complex as well defining the coordinates of each component. Hierarchical order in defining and determining the location and value of each component defines total value alone and relative to other categories (Tabibian et al., 201۲: 65, quoted by Naghizadeh, 1997). One of the principles of Iranian architecture is the presence of order and sequence in occupying spaces and performance occurrence of activities, movement and vision. Space hierarchy is the classification and sequence of regular urban centers which is done in terms of quantitative and qualitative factors (Nazarian, 200۷:157). To define the principle of spatial hierarchy, the concept of spatial sequence has to be first developed.

4.2. What is Sequence?

Sequence is taken from English word meaning 'part'. In some books, sequence means 'content' in a novel. In theatre, it is meant as science or movement in music. Therefore, sequence is the combination of several scenes created from the interaction part action and aims at a certain end. This definition can be generalized in urban creative space. The path movement can be sensed as an impression string which is related to space of building or collection of interior and exterior spaces

or hierarchy of urban spaces. Since we move with time, one may experience space with relation to the place where he has been and where he has expected to go. If several sequences occur consecutively, there is a regular relationship between them. The relationship between sequences may be function of peak or nadir; in other words, the value of a sequence is more or less than the following sequence. In an urban space, there is rare equivalent sequence together. In fact, two sequences are never of the same value. This difference in value can be expressed in components of form, function and meaning. This difference of value and expression of sequence value creates hierarchy (Pakzad, 200^:138-143). Hierarchy is present wherever the sequences are located side by side. Arranging of public, semi-public and private or vice-versa is a sequence with which the difference of value shows hierarchy. Throughout history, physical urban systems have had a hierarchy from public to the private space. Human has got closer from public space to the private space to reach private home unit following the stages in the city over time.

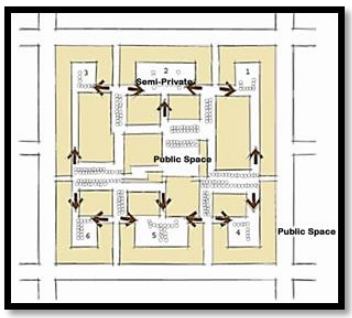

Fig 2 Effect of spatial hierarchy in the formation of public and private space (source: Tavassoli, 1990: 86).

The urban landscape is not a fixed image that is seen by the observer from a specific point, but it can be perceived in succession. The character of space is not influenced by single building and element of a scene, but depends on the order of scene that influences the individual. The perception and evaluation of urban space should consider the qualities of scene (spatial quality) and their arrangement (sequence quality) so as to properly coordinate the perceptions and the effect of succession. The important point in planning human habitat is concerned with the principle of hierarchy that has different spatial, performance, accessibility, administration and social dimensions. This hierarchy has an inseparable relationship with the concept of territory. The two important issues of spatial hierarchy and hierarchy of accessibility and function in urban design are indeed a step in determining the right territory and ensuring confidentiality in urban space (Bahraini and Tajbakhsh, 2000: 22). Tavassoli states that the hierarchical principle defines and determines the relationship between different areas of habitat from public to private (public, semi-public, semi-private and private) because of housing characteristic called as ‘Shrine’.

Fig 3 Spatial hierarchy (source: Tavassoli, 1990: 97)

In Iran, the initial spatial order resulting from continuous hierarchy of space is related to the main market path that traditionally has been the main gateway to the city and passes through the city center or is connected to the core space of palace or grand mosque. The existence of secondary spatial systems such as alleys of the residential neighborhood, enclosed spaces such as shops along the market and shops surrounding the school yards, caravanserai or houses all depends on the primary, secondary or core spaces (semi-public, semi-private spaces). After passing through the urban hierarchy and reaching home, the entry to the house also has a hierarchy. According to Tavassoli, the principle of spatial continuity of physical organization of the ancient Iranian city is consistent with spatial connectivity between elements of collection, such as square, main road and city center based on community centers. Generally, according to Gehl, the clear hierarchy is to show the most important space (2014: 67). This principle is one of the most important laws for urban solidarity. In the past cities, hierarchy has been considered consistently at all scales from urban skeleton to architectural composition. Therefore, a review on the contemporary urban experience shows that hierarchy was taken into consideration as a formal case and not as a comprehensive concept. In fact, raster and grid layout of most urban plan are only in the solidarity of the city, because plan with different goals provided for cities have ignored the mid-scale and common spaces as two elements that create the hierarchy and urban coherence.

According to Gehl, this principle opposes with urban planning. Today designers usually design large common areas and large single space. Streets, boulevards, alleys, path, balconies, gardens, rooftop gardens, central courtyard, squares, parks and recreational areas are distributed generously on the map without the least regard of the natural sequence of important space and it is significant to build these spaces (Gehl, 2014: 67).

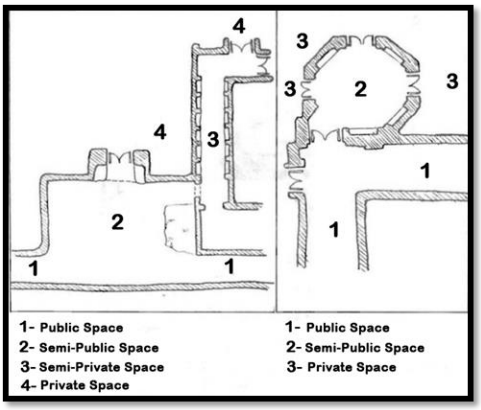

Fig 4 Hierarchy in the traditional neighborhood (source: Shia, 2007: 77)

4.3. Principle of Beat of the Song or Rhythm

One of the principles that lead to the formation of semi-public spaces is the principle of beat of song or rhythm. This term is commonly used in music but also common in visual art. Rhythm in music means sequence of the song strokes that are used to harmonize the music. In other words, repetitive successive sustained movement in a given time is called musical weight or rhythm (www.fa.wikipedia.org). In visual arts, rhythm has a visual meaning such as repetition, variation and movement of visual elements in visual space. In other words, regular repetition and successive picture element creates visual beats of the song. It is noted that rhythm and its different conditions might have an influence on all natural elements, events and the energy released in the surrounding environment as well in concept and cognitive imagination. In other words, rhythm is the important

component of ‘subjective’ and ‘objective’ reality. Everything that exists is composed of an inner rhythm and involved in the development of foreign and external rhythm and finally forms larger regular collections. The rhythm has energy in case of harmony with the surrounding environment and if they are not compatible and aligned they harm each other and create disturbance in the process of moving together. The regular rhythm of nature is earth rotation around itself and around the sun, different seasons of the year, fertility of plants and trees, and heart rate. Daily life related issues and different fields of human activity are regular rhythms, in alteration and evolution. This principle is derived from the principle of composition of spaces in the city.

Rhythm is called the regular recurring or harmony lines, shapes, forms or color; it includes the fundamental theory of recurring and is considered as a strategy to organize forms and spaces in architecture. The simplest form of recurring is the linear type that is formed of many components. For components to be classified as repetition it is not necessary to be similar, they may have common features or have common denomination and yet it is individually unique belonging to a family. Based on their physical characteristics, the architectural form and space as repetition can be organized as size, shape and specification. The detail in visual art has the meaning of semantic visual rhythm such as repetition, change and movement of visual elements in visual space. In other words, regular recurring and continuity of a visual element creates visual beats of the song. In general, rhythm is classified into four visual beat of the song:

1. *Uniform repetition:* In this beat of song an image repeats smoothly and continuously. This rhythm causes a kind of movement and self-reaction and attracts audience attention, but due to lack of diversity has an adverse effect and after a while it is boring.

2. *Alternative repetition:* In this beat of song, a visual element is repeated but the repetition varies with frequent changes so that the audience is always waiting for the repetition; this beat of song is effective in the formation of semi-public spaces.

3. *Evolution repetition:* In this type of beat of song, the picture or visual element starts from a special case and gradually reaches a fresh situation.

4. *Wave repetition:* This type of beat of song is created by using moving curves of surfaces and lines, for example, sands of the desert.

Therefore, beat of song is formed based on the repetition of elements in space and time. Hence, one can say that in urban design repetition of each formal element (shape, color, etc.) is according to certain order, rhythm or beat of song. Repetition of elements provides a sense of order. Also, there is a difference in the recurring element that causes the prevention of uniformity and diversity. When similar elements are together, the feeling of regularity increases. The repeating beat of song helps to create a certain structure in space. The beat of song occurs when the elements repeat with a similar force at equal or organized distances. The similar forms, at similar distances from each other, create the beat of song. Due to the formation of beat of song, space elements can be perceived in multiple layers. If a body in space is divisible into smaller units, where the beat of song element is repeated in smaller amount, it gives rise to a simple geometric order. The beat of song alone does not make an order but can enhance the existing order. In this case, this regular repetition could occur so slowly that it cannot be perceived (Pakzad, 200۸:142). In the residential neighborhood, regular and formal repetition of semi-private and semi-public spaces and the difference in them causes the creation of beat of song and prevents uniformity. These elements together are repeated with an approximately equal interval that helps in the sense of order and beat of song in space perceived through walking. Walking is a method of engaging and experiencing the location. Understanding everyday’s beat of song of places is through walking experience in the sense of familiarity, belonging and identity in these places and in this manner the process of

increasing personal involvement within the city. The beat of song index is the key component of urban areas due to the sense of place. Walking is a temporal way to sense and experience the beat of song of urban places that highlights the quality beat of song of city by walking as a special condition through which one can perceive and experience beat of song (www.anthropology.ir).

Repetition in rhythm or beat of song as seen in music or architecture is a principle and an extremely simple composition that tries to establish a sense of solidarity. In addition, all repetitive forms may be the result of addition or division of the whole or create a chain without a general form. In architectural scale and urban design, lack of limitation in a way without start and end can easily create disturbance (Meiss, 2014: 44). In the designing and configuration of the urban structure this principle is of complementary balance. This means that if the plan hold to these three principles one can provide a well-informed composition. It is the same in construction of urban spaces; the beat of song principle is the subset of composition. The composition of urban spaces should be organized in such a way that while moving in the city the principle beat of song is clearly visible to the individual. In fact, rhythm is an iterative process and movement is an inseparable part of it. That means that the movement always starts from a place where an element regularly gets repeated. The repeating rhythm causes the movement of eye to follow it. It should be noted that in any effect the regular and uniform rhythm soon becomes boring. Therefore, in each art composition, the form and composition must be rich that is always striking (www.anthropology.ir). Despite all this, the principle of beat of song in relation to the level of urban spaces without semi-public spaces would be meaningless. Because in this case, the public places of the city reach private spaces and walking in the city and experiencing the spaces of the city are perceived continuously and without rhythm. These intermediate spaces located in the neighborhood cause the person to get familiar from his private space to a shared space, and then by passing through it, he reaches the crowded urban spaces; in the way back, this process repeats from end to start causing the creation of beat of song in shaping the urban spaces. This is not only an evolutionary process; it is not boring and if these spaces are removed from the structure of urban space, this beat of song will be eroded in the city.

4.4. Principle of Privacy and Territory

Another principle for the formation of semi-public spaces is employing the principle of privacy and territory. Privacy means shelter, individual house and its surrounding that is safe from disturbances by others. The meaning of confidentiality in architecture and urban spaces is to shape the space in such a way that privacy is both physical and conceptual. To have privacy in two physical-spatial areas is the focus on the principles that shape the security of the space. In the realm of meaning, it is a feature that brings dignity and value to architectural spaces such that a space helps a person to relax (Seifian and Mahmoudi, 2008: 6). Therefore, the principle of privacy and territory is to know the boundary of space in which human lives. Usually the spatial territory is identified as both public and private space, but in the old texture city of Iran, the partitions of these spaces are defined. The semi-public and semi-private spaces as dead-end or porch connecting several houses have been the territory of several residential units and public spaces as passageway and squares that have been the territory of neighborhood. It is noted that in exploring old city of Iran, this principle in the formation of city spaces had an important role and in most textures of the city, three different spaces can be separated:

1. Private space that includes courtyard and elements surrounding it.
2. Semi-private and semi-public space as dead-end or porch.
3. Public space as passageway and square.

Generally, the territory can be divided into three categories:

1. Territory of a single unit neighborhood.

2. Territory of several residential units (i.e., collection of neighborhood), in old cities as an open or closed dead-end.

3. Territory of one or more housing units in old cities as a space which is a set-back in relation to the public passing space (Tavassoli, 1990: 47).

Therefore, each city space from a small space (e.g. house) to a large space (city) has a specific range. The physical space in which the human dwells requires the formation of arena that is intimate, safe and calm. Thus, according to the philology root of 'Shrine' the intimate space is a space that in terms of physical for the user safety and security and the quality of space should be in a way that provides the individual with comfort (Seifian and Mahmudi, 2008: 6). The semi-public spaces, because of these features in individual residential environment and neighborhood units, are examples of manifestation of the principle, privacy and territory in the neighborhood. As a result, semi-public and semi-private spaces territory is important because of the following reasons:

1. The residents of the families whose door is opened to porch, podium or dead-end gave the feeling of ownership and security.

2. The residents of these houses can live without interference of others in their own private spaces and come together in semi-private spaces and take decision. This is effective in strengthening the social life of the owners of this space.

3. This space is limited to few families and causes the acquaintance of residents with each other and one of results is the alertness of the family to take care of the common spaces.

4. Because this space is mainly used by the inhabitants, it is far away from the crowd and traffic of the public space.

All this evidence claims that semi-public space in their neighborhood is significant in application of urban design. In addition, as previously mentioned, the principles of territory and principle of hierarchy are intimately related to each other. The important point is that the application of the principle of hierarchy in the system of urban space and architecture along with separating the public and private space from each other and categorizing the accessibility has a significant role in strengthening the privacy in spatial structure (Seifian and Mahmoudi, 2008: 9). In this regard, Bahrani states that most human space requirements are only provided with the field of environment. The areas of residential environment require spatial hierarchy, functional, social, etc., which are all associated with the non-separable concept of territory (Eynifar and Aghalatifi, 2011: 18). This means that in the spatial organization of city, the design of spatial hierarchy from micro to macro causes the observation and forming of another principle which is the principle of privacy and territory. As a result, in observing this principle, one might witness the definition of specific territory of private, semi-private, public and semi-public with identifiable privacy in urban design and in traditional Iranian architecture. The suitable response to these values has a major impact on the dependent creation of elements, architectural forms, establishment of locations, the size of openings, building entrances and roofs (Seifian and Mahmoudi, 2008:10). With respect to this principle, it has an impact on the quality of relationship of man with the residential environment, and its meaning in different circumstances does not have accurate and precise dimensions. This is the most basic step in revealing this principle according to the residential environment, and it is not changeable in the concept of territory. This is possible with the inclusion of intermediate spaces (semi-public) between public and private spaces of the city.

4.5. Principle of Spatial Contrast

Another principle, having a special role in the formation of semi-public spaces, is the principle of spatial contrast. In today's cities, layers' intertwined mass and empty spaces are combined in a way that the recognition and spatial contrast faces challenges (Pourjafar and Mahmoudinejad, 2010: 99). In the Moein's dictionary, contrast means being separated from each other. The traditional architecture has priceless treasures of heterogeneous and different spaces. The visual and emotional impact of these spaces is to avoid the monotony of architectural and urban spaces. Spaces that are characteristics of elements have specific differences known as heterogeneous spaces. Tavassoli defines contrasting spaces as length, width, height and elements, and confining components are different from each other. The old city of Iran has a wealth of contrasting and different spaces which differ from the west. He also states that the value of space contrast reduces the monotony of spaces connectors (Tavassoli, 1990: 62). Two characteristics of space contrast in the old cities of Iran are:

1. Broad and narrow space
2. Open and closed spaces (i.e., large and small squares like in Zavareh or Babavali passageways in Kashan).

In addition, the spatial diversity can be attributed to the use of spatial contrast principles. In other words, one of the features that causes the quality of spatial diversity is the spatial contrast (Changizi and Ahmadian, 2013: 56-57). Different spaces arise from widening or shrinkage of spaces. Creating the height difference or variation in level of openness is effective in creating consecutive spaces (Thiis Evensen, 2000: 66). Therefore, elements and factors that create the consecutive space can be divided as follows:

- Change in the scale of two spaces
- Change in the type of space
- Change in the temperature of the enclosed space
- Change in the element that confines the space
- Color

Therefore, the semi-public space with change in the performance of scale causes the transition from private to public space with a gentle slope creating a new space in the neighborhood. Additionally, this type of spaces in the neighborhood differs with almost identical performance because some of them are formed at the edge of the crossing as rectangular or dynamic mode or induce a shot pause. Some semi-public spaces are created at the end of the dead-end. Some are created as a square focused with elements or trees at the center; after passing a long passage, a static environment is created, but what is important is this difference in the form and shaping of these spaces; the principle of contrast shows more intensity and enhances the spatial variability.

In fact, heterogeneity of elements and urban spaces and its melody in relation with other elements and spaces causes the urban space to get free from consistency and identity. In applying the principle of contrast in the formation of intermediate spaces, Tavassoli, in an example of Sheikh Lotfollah mosque, states that the original charm of the mosque in contrast and proportion in two major cross spaces is the Naghshjahan square and the other is the space below the dome and the space between the two. This space between them is comprised of three and/or five spaces. It can be said that the observer leads from the vast space of the square to the first space that is the entrance of the mosque. Then goes up few steps and enters the second space, and afterwards is a threshold entry to the mosque. This threshold is a narrow space with two-step length and thickness of the pier. When an observer enters the mosque, he is released from the outside atmosphere (i.e., square space). In this corridor, the outside is forgotten and all things take place in the interior. It takes 40

steps thorough the passageway till one reaches the interior of the chamber. Another pause is the complete breaking out from the exterior and connecting to the inner space that is the space under the dome (fig 6) (Tavassoli and Bonyadi, 2008:18).

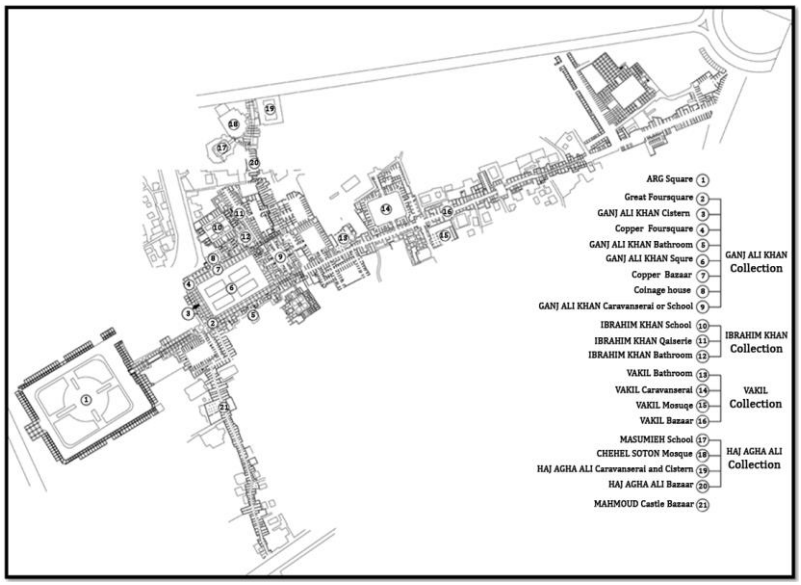

Fig 5 Spatial variation – the Kerman market (source: Changizi and Ahmadian, 2013: 56-57)

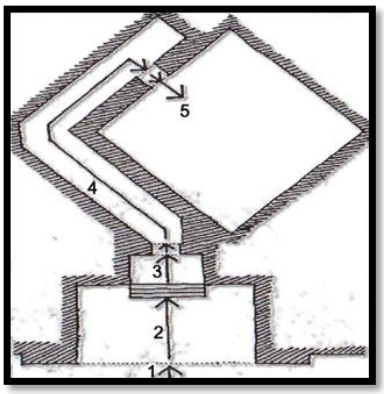

Fig 6 Isfahan, Sheikh Lotfollah mosque spaces (source: Tavassoli and Bonyadi, 2008: 19)

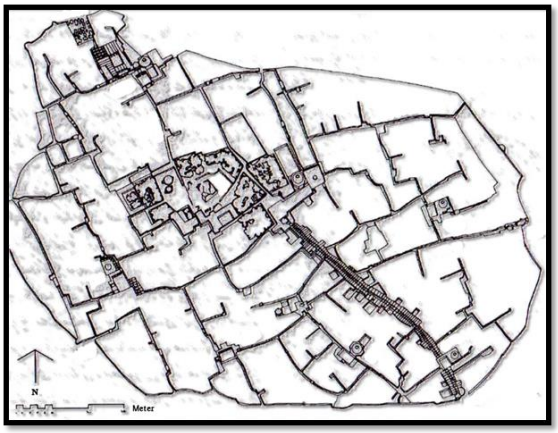

Fig 7 Old Nain (source: Tavassoli and Bonyadi, 2008: 57)

The single squares, in all directions, are related to each other, but have an impact on the observer visually and aesthetically based on the cognitive achieving of the observer from the consecutive images in contrasting spaces. One more example that can be made here is the construction of the Nain city space which is exceptional due to the contrasting and connecting spaces (fig 7). Despite the deterioration, its physical construction is completely clear. Another example is Yazd because of its spatial variability and durability of its mosque courtyard as a public space of the city (fig 8). This feature is clearly seen in many historical textures of Iran. Chapman gives examples about the continuous spaces of the Beth city which was designed by John Wood. He describes that here one sees the street with a steep slope which continues from a square space (Queen square) to the circular and flat space of the circus.

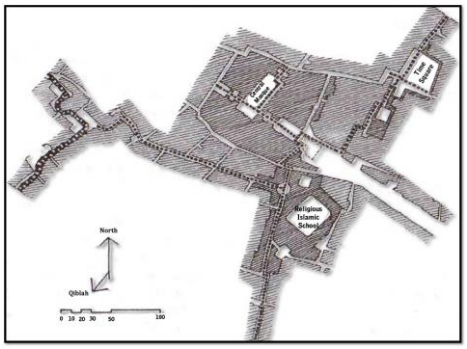

Fig 8 Spatial relationship of Jame mosque of Yazd with the surrounding passageways (source: Tavassoli and Bonyadi, 2008: 52)

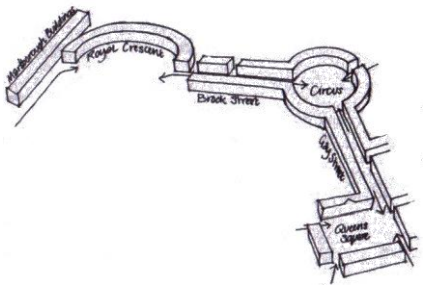

Fig 9 Sequence of spaces, Beth city (Chapman, 2016: 185)

Other streets are at a distance of one-third around the circus on a flat surface towards massive half oval-shaped buildings (Royal Crescent) and from the south towards the open park land spaces and then a steep path towards the river valley (fig 9). He introduces this example as an excellent example for continuous space (Chapman, 2016: 183). As a result, the basic principle governing the urban design is creating contrasting spaces by continuity providing a solidarity to the whole set. To establish this principle, one should note the feature differences and performance of spaces and activities conducted and also the areas and territories. Also, if sufficient attention is not given to these issues and they are designed by space contrast, it may lead to spatial chaos; therefore, one should always maintain the balance.

5. Conclusion

The formation of public-private relationship in the city means the relation between house, city and the neighborhood; the neighborhood space as a transition space has the identity from private to public space. The result states that the four principles for the formation of semi-public space within the neighborhood spatial organization are spatial hierarchy, privacy and contrast, spatial contrast and spatial beat of song.

1. The principle of hierarchy of semi-public space in spatial network structure has caused interconnected urban spatial structures. Basically, employing intermediate and transition spaces between public and private are based on this principle. Therefore, the explanation of this principle in design of urban spatial organization without taking into account the transition space is impossible.

2. Bringing together the urban space at different levels of performance creates a type of beat of song in the formation and composition of urban spaces. This kind of evolutionary beat of song is gradually changed into a new state. Though having common activities, they are different. As a result of the repetition in the formation of these spaces, the beat of song is not boring. Thus, utilizing the principle of beat of song causes the composition of urban spaces including public, semi-public, private and semi-private spaces perceived in the process.

3. People need to relax and feel safe in their private life. Since there exists passing from one area to another, the organization of human environment is possible by adopting the correct approach in identifying their private and public areas and creating accurate hierarchy in all fields. As a result, one of the most fundamental steps in identifying type of territory is to pay attention to the residential areas.

4. The principle of spatial contrast creates spatial diversity for the observer by changing the route width, large and small scales, open spaces, the degree of closeness, and the static and dynamic dimensions according to their form; a person then might be moving in the city and urban neighborhood, and release the monotony of the urban space. The implementation of the principle of contrast creates intermediate spaces with scale, as the designer needs to create a contrasting urban space to implement the differences in type, form, scale and application of space and type of activities in them. This leads to the formation of semi-public spaces in the neighborhood with various forms, and because of the application of this principle, the urban space gets free from its monotony and lack of identity.

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Tie Design using Electrical Conductive Fabrics

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Abstract

One of the clothing requirements, especially for men, is the tie that was initially used by the ancient Iranians. The designing of ties without an Iranian design on them, despite the fact that they are originated out of Eastern traditions, is one of weaknesses of fabric and clothes design. One of the new methods to create designs on textiles is the use of new technology; in this research light was used for tie design. Due to the replica tie designs on the market, this study attempts to use original Iranian designs, through conductive fabrics, to produce light and to create a new design. This study uses graphene oxide for the production of conductive fabrics. Finally, the tie design by passing electric current through the tie has been simulated and a set of tie designs are provided.

Keywords: Tie; Electrical Conductive Fabric; Design

1. Introduction

Originally, ties were used by ancient Iranians, and after that they were used by the European countries. The word ‘tie’ is taken from the word ‘Croix’, which means connecting two things together. After surfing the internet, and searching through dictionaries and English Encyclopedias, it was concluded that in Dehkhoda dictionary the tie is stated as tying two things together. Tie in English is known as either ‘Cravat’ or ‘tie’. According to Webster dictionary, the word is taken from the French word ‘Cravate’, originated about 1656 years ago, which refers to a scarf that is tied around the neck. In Oxford dictionary, tie is defined as a short and narrow strap used by men, which is tied with a knot around the neck. The word was first mentioned in the Oxford dictionary, and it came into existence in the 17th century, in France. Tie is taken from the word ‘Croat’, because for

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the first time it was used by Croatian soldiers (Croat ethnic) who served in the French army (Mohaghaghi, 2005: 1). According to the above documentation, a great similarity exists in the meaning between the word ‘tie’ in Persia and ‘tie’ in England, but there is no common roots for the two words. Therefore, this issue should not be discussed without close examination.

In British and French cultures, it has been said that the term ‘tie’ started to spread from the mid-17th century. They state that Croatian soldiers (from Croatia) in Hong Kingdom, also called ‘Croate’ during the era of Louis XIV, tied scarves around their necks, and that this custom began since that era. Perhaps the people of France in the 17th century learnt from the Croatian soldiers to tie scarves around the neck, and even if we accept that the neck scarf is named ’tie’, there is no reason to deny this issue, because the origin of this term is from Persia, and relevant document evidence supporting that exists. In the beginning, Avesta was studied, which is a book that dates back to thousands of years ago; it mentioned twelve things that are needed by a man in war, the eighth word of which is ‘Coeres’ taken from the word ‘Coerat’ (a tie or bow tie), and it is said that Coerat was tied to the armor. Figure 1 shows the image of ‘Shapur I’, the son of Ardeshir Papkan, carved on stone in Naqsh-e-Rajab, and a tie or something similar can be seen (Mohammad Moghaddam, 1935: 30).

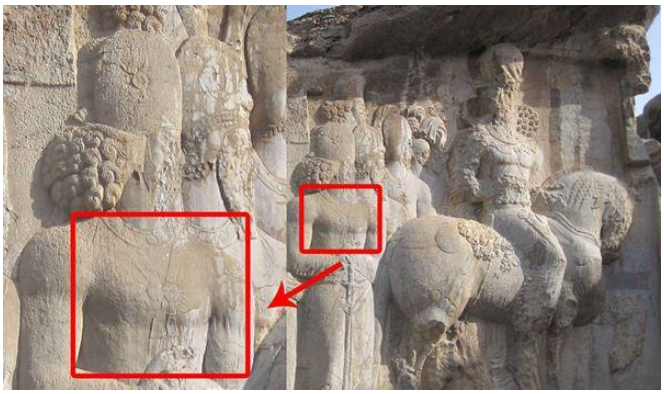

Fig 1 Shapur I son of Ardeshir Papkan in Naqsh-e-Rajab written on stone (Moghaddam, 1935: 30)

Previously, the tie was wider and was tied on the front of the chest, and as seen in the figure, the kings and noble guards wore it. This phenomenon can also be seen in many figures engraved on the stone in Taq-e-Bostan, as well as on ancient coins. One can say that bow-tie came to existence with a slight change in the tie. This front chest was seen as an ethic until the Safavid period. Some images on the stone walls of Persepolis museum and the coronation ceremony of Ardeshir II depicted on the stones in Taq-e-Bostan, along with images of the kings of ancient times prove these claims (Moghaddam, 1935: 30).

Noel Malcolm, an English scholar, in his book entitled, ‘A brief history of Bosnia’, believes that tie for the first time was brought to Europe from Iran. The Iranians, in order to be different from others, used to tie a fabric on the front of their shirts. However, according to contemporary history, tie was brought to France by the Croatians (Moghaddam, 1935: 31). The origin of tie is from Iranian people, although it has gone around the world through France, and was used in 1656 by Louis XIV. It is interesting to know that Croatians (Croatia) in south-east Europe were actually the ancient khoravats (khooravat) or (khoorabad) that had migrated to Balkan Peninsula. They hung beautiful cloths for aesthetic purposes (Moghaddam, 1935: 31). Noel Malcolm has named this term as ‘friendly’ (khoorabad). This term is still used among the people of Kermanshah and Illam as ‘khoorava’.

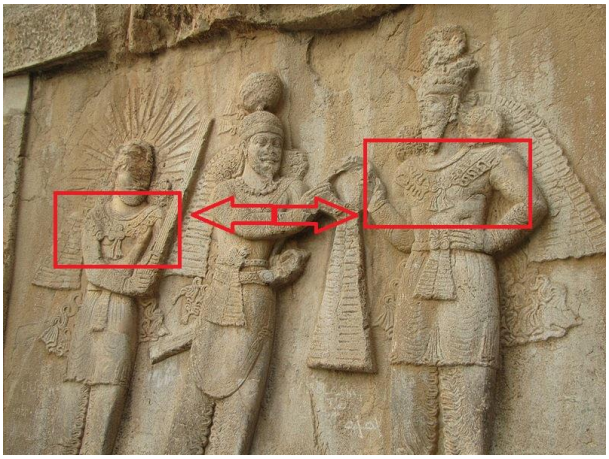

Fig 2 Ardeshir II in middle, Ahura Mazda right and Zoroast at the left (Moghaddam, 1935: 30)

Noel Malcolm has conducted a research in his book on the Iranian connection to the past of Yugoslavia. He believes the term ‘tie’ or ‘Hravat’ does not have any roots in the Serbian language. This term is similar to the Iranian name which has been found on stone plates in the area of Greece, in southern Russia. The root of the name is khravat, which in Avesta means ‘friendly’. Historical research shows that the Croatian race from 3000 years ago migrated from Iran, to Croatia, Serbia and Bosnia. Perhaps, the great peak of migration to these nations was 1700 years ago. The reason of this migration was the suppression of Manaviyan in Sasanian period. Based on the research conducted by Noel Malcolm, the term ‘Serb’ is taken from the Persian term ‘Charv’, which means flock. According to old documents, Serbian and Croatian people include people with Persian roots who later joined the Slavic people. Noel Malcolm believes that the new theories in this context are consistent with historical evidence. Some Croat theorists prefer their common heritage to be Iranians, rather than Slavic. Such theories, especially during World War II, were strengthened when the Iranian race were classified higher than the Slavic races, according to the Germans. As stated by Malcolm, Croats and Serbs were refugees from Iran who migrated at the same time to Balkans. The early migrators, in order to be distinguished from other nations called themselves ‘khravat’ or ‘Croat’. These immigrants tied beautiful scarves around their necks that later were popularly known as ‘tie’ worldwide.

In 1656, Louis XIV formed the Croatian regiment of volunteers in his army. Members of the regiment, according to their predecessors, tied a silk handkerchief around their necks with a knot at the end. This handkerchief was also tied around the injuries of the soldiers. Since then, the silk handkerchief was accepted as a part of the military ornament in the French army, and the term ‘a lacroate’ entered the French language. After 170 years, neck-tie became official worldwide (Moghaddam, 1935: 31). Hence, the French people wore neck handkerchiefs which had originated from the soldiers, and named it ‘Tie’. The term ‘tie’, and the way to tie it does not have a classical background because the Europeans made a ‘national origin’ and associated it with the Croat soldiers (Moghaddam, 1935: 32). With regard to the picture carved in Naqsh-e-Rajab (3 km north of Persepolis) (fig 3), and according to ‘Hearthsfield’, Papak is the father of Ardeshir who is wearing (med) clothes, and it is quite clear that ‘koeret’ and the term ‘tie’ is taken from there.

This tie is wider, and was tied by the kings and high-ranking military men. It is seen in the figures carved on stone and ancient on coins. For example, the stone carving in Tagh-e-Bostan (fig 4).

Fig 3 Picture in Naqsh-e-Rajab (3 km north of Persepolis) (Moghaddam, 1935: 32)

Fig 4 Stone carving at Tagh-e-Bastan (Moghaddam, 1935: 32)

This background, until the Safavid period and later, was the custom seen on Shah Abbas's figure (fig 5). In French language, it is 'Cuirasse' which is taken from the Italian word 'Corazza', and its origin is 'kuress', from Avesta.

Fig 5 Cuirasses (Moghaddam, 1935: 32)

According to the Europeans, 'Cuirasse' has been used since the 15th century in Europe and since it had no classical background, it came up with the original term 'Corocea' which originates from 'Coriaceus', meaning 'leather' and from the Latin word 'Corium', meaning 'leather'.

In Mazandaran, people wear local costumes, and the custom that the groom wears on the wedding night includes a red or green scarf which is worn around the neck. It symbolises close attachment to someone, just like wearing a ring on the ring finger. In author's opinion, tie in ancient Iran was like 'kosti', a religious symbol relating to a place. Kosti is a rope tied to the waist, and tie was worn around the neck (Moghaddam, 1935: 33). However, tie in Persian dictionary is a light and delicate fabric which is knotted around the neck in a special way and hung in front of the chest (Moghaddam, 1935: 33).

2. Tie Psychology

Scientifically, what thoroughly reflects the changes in the body appearance, and all the materials added as a supplement to the body are called clothes. These changes can be permanent such as plastic surgery, or temporary like using perfumes. However, the changes and extension in the body can be one, several, or can even affect all the human senses. But what we consider as things to wear are in fact supplements, used for different purposes such as beauty, protection from the cold and heat, chastity, piety, etc. Fashion design researchers Higgins and Eicher have considered two basic functions for clothes; one as the modifier component of the body, and the other as the medium for communication (Higgins and Eicher, 1992).

The design of cloth is mostly made up of colors, textures, lines, and shapes that come from the engagement of body with the changes (Delong, 1998). According to the definition, the shape of

clothes includes all the details of the appearance, such as the outline, shape of buttons, and the cutting of sleeves and collars. Every piece of clothing and apparel requires thinking and thoughts which forms the motivation of its production and design. The message present in the clothes may be functional or esthetic or it may be a collection of signs, including social, cultural, political and mythical messages (Mosavi and Tavanaei, 2005:1).

Clothes serve as an interface that protects the human body from the effects of the physical environment and psychology. People may wear necklaces and amulets or in some cases clothes for luck, good fortune, and to repel evil spirits, which shows that clothing items can be considered to hold powers, in the minds of people. Social psychology is the study of people in social contexts, and with respect to the important role of clothing in the society, it also investigates the beliefs, attitudes, emotions and different behaviors of individuals regarding clothing. Nowadays, clothes are an important part of cultural studies in the science of anthropology. Scientists believe that the clothes of each person have a direct effect on the recognition process. Most of us believe that the way of wearing clothes plays an important role in communicating with others, and in our individual attractiveness. Scientists have written a number of texts in order to study the effects of clothes on people's psychological processes, and with their interactions with the environment. As a result of these studies, they found out that clothes stimulate the body and the brain, and that the clothes which people wear put them in different psychological states.

In addition to the effects of clothes on the individuals wearing clothes, they also create feelings and emotions in people who see them on others. These feelings are different with respect to characteristics such as gender, age, talent, skill, knowledge, experience, and interest. These individual characteristics are highly effective in individual interaction (Delong, 1998). Therefore, the person wearing clothes should be aware of the consequences and effects of clothes worn, and to know that others will judge them what one is wearing. For example, sometimes the clothes with light or dark textures, and with shapes and curved lines create an impression of subtlety and femininity, and in other cases, for an older person, it creates the feeling of nostalgia and association with the experiences of adolescence. Therefore, time, location, values, past purposes, and present society has a huge impact on the viewer of clothes.

The emergence of 'fashion' plays an important role in the change in people's attitude in relation to the type of clothing and lifestyles. Fashion is an innovative look that has constantly changed and evolved over time and in response to the cultural values of the society. Fashion as a model accepted by the society usually means 'up-to-date' and 'novel', and it leads to the creation of new and innovative products. This innovation is due to new technology, cultural events, or designers' creativity. Fashion is a social phenomenon, which on the one hand the person is accompanied by the community, and on the other hand it distinguishes the person from others (Javadi and Sayedal, 2007: 3). This phenomenon provides suitable ground for economic growth in a way that is in harmony with the cultural values and social arts. In today's fashion world, designers try to change the public taste by encouraging people to wear the latest fashion clothing, shoes, jewelry, and other items. Recently, fashion has become one of the important criteria in evaluation and aesthetic of costumes.

3. Aesthetic and Coordinating Costumes

The aesthetic of clothing includes science that helps to improve the quality of people's lives and provides human satisfaction. In general terms, aesthetic is the satisfaction that is achieved after experiencing with the five senses of humans, namely sight, smell, touch, hearing, and taste. This pleasure may be generated in the person wearing the clothes by recognizing the values and benefits

of a good design. The study of aesthetics of clothing is devoted to the types of clothes, effects of clothes on people or on the person who is wearing the clothes, and the attitude generated by them at a particular place and time. In simple words, aesthetic of clothes argues about how people can choose; so that their attire looks better in the eyes of others. Also, aesthetic includes the discovery of the nature of fashion. Understanding aesthetic is the response to the viewer or the person wearing the clothes, through awareness of the form of clothes, the physical and cultural environment, and the interaction between them (Delong, 1998).

Every day, most people before leaving home come across the question of 'what to wear?' and spend a lot of time to choose the clothes to wear. This is because they intend to choose the best clothes according to their choice and sense of fashion so as to create the maximum impact on their social relationships. The concern of people in the selection of clothes is their coordination. Coordination is an English word made of two Latin words (co) and (order) which means 'sort the order'. Being well dressed, like a painting or a photograph is the combination of beauty and harmony. The question is how one can put together various pieces of clothes such as suits, shirts, ties, belts, shoes, socks, and sweaters to create a positive image? Research has shown that there is a simple answer to this question, and it is the fashion industry at the time, as well as the different cultures. In fact, there are four important elements in the choice of clothes regarding harmony, and by focusing on them one can create a fundamental change in their image. These four elements are design, color, weight, and texture. Selection of types of designs or motifs of fabric can lead to the clothes being viewed as cool or ridiculous by others. Color has a major impact on the person wearing clothes according to the psychological properties of colors, which convey messages such as trust, vitality, etc. The texture and weight of fabric is in direct relation with the different times of day or year (Javadi and Sayedal, 2007: 3).

4. Conductive Fabrics

4.1. World's First Electronic Textile Production

An international team of researchers have succeeded in producing the world's first electronic fabric using graphene.

Researchers in the system and computer engineering institute of the University of Exeter, as well as the micro systems and Nano-technology in Lisbon, Lisbon University, Aveiro Company in Portugal, and textile research center in Belgium have developed a new method for merging the flexible and transparent electrodes in the fiber of fabrics. This discovery could produce a wearable, lightweight, durable, and portable electronic device such as a piece clothing containing computers, mobile phone and mp3. Graphene, with a thickness of one atom is the thinnest material with the capability of electrical conductivity. This material is flexible and is known as the strongest material around. In recent years, scientists and engineers have been trying to use graphene in wearable electronic devices. New research has shown that a single layer graphene has electrical, mechanical, and optical properties. This has given an attractive offer as a transparent electrode to be used in wearable electronics. In this way, graphene is manufactured by a method known as 'Chemical Vapor Deposition' (CVD) on copper coils, using a new system called 'Nano-CVD'.

The researchers have invented a new method to convert graphene from copper coils to polypropylene fibers, which have been used in the textile industry. According to the scientists, this achievement can be of great help in wide sectors of health care and hygiene. The result of this study is published in the journal of Scientific Reports.

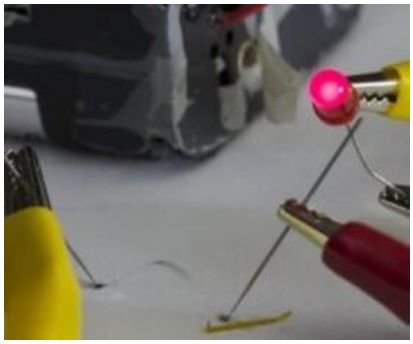

Fig 6 World's first electronic textile production using graphene

5. Methods for Conductive Fabric to Produce Tie

5.1. Materials and Goods used:

Polyester fabric, and the specification of chemical used is shown in table 1 and 2.

Table 1 Cloth properties in use

Type of weave	Manufacturer	Thread type wrap and weft	Weight (g/m2)	Warp density (1/cm)	Weft density (1/cm)	Description
Wreathy	Yazd Bafth	Warp polyester viscose and weft 100% polyester	145	30	36	-

Table 2 Specification of chemical material used

Material name	Name of Manufacturing company	Chemical formula
Graphite	Merck Germany	C
Sulfuric acid	Merck Germany	H_2SO_4
Potassium Permanganate	Merck Germany	$KMNO_4$
Hydrogen Peroxide	Merck Germany	H_2O_2
Hydrochloric acid	Merck Germany	HCL
Aniline	Merck Germany	C_6H_7N
Hydrogen Sulfide	Merck Germany	H_2S

5.2. Instrument and Equipment

Specification of the instruments and equipments used in this research is summarized in table 3

Table 3 Specification of the equipment used

Name of the Instrument	Manufacturing company	Description
Aven	Shimi fan Germany	-
Magnetic stirrer	BANTE MS300 Magnetic stirrer	-
Digital scale	KERN Germany	Accuracy 0.0001 gram
Ultrasonic	VICNZA Italia	-
FTIR	BRNKER Germany	-
Centrifuge	KOKNSAN Japan	-
Ohm meter	MIOKI Japan	-

6. Methodology

6.1. Fabric Preparation and Surface Modification

Polyester, which has a broad application in various fields was of interest for researchers, and an attempt is made to modify it in order to develop a new application for polyester. Over the past few decades, studies have been conducted on the alkaline hydrolysis of yarn and polyester fabric to improve their physical properties. Polyester alkaline hydrolysis with caustic soda is the reaction of surface degradation that causes shortening of the polymer chain, and consequently the thinning and the cavity on the surface of the fiber. Also, alkaline hydrolysis of polyester fibers has less staining, water absorption, air permeability, abrasion resistance, dirt release, static load generation, and hardness.

6.2. Graphite Oxide Synthesis

Initially, graphite sulfuric acid is added and placed in an environment of magnetic stirrer for 24 hours. Then potassium permanganate is added and kept for 2 hours at a temperature of 50ºC to be stirred. After this step, 140 ml of distilled water with 10 ml hydrogen peroxide is added to the solution and stirred for 50 minutes, and then the solution is separated by a centrifuge device. In the next step, hydrochloric acid is added to the solution for washing, which remains in the solution for 50 minutes. Later the solution is centrifuged again, and washed with distilled water and centrifuged once more. After the centrifuge, the solution is mixed with 50 ml of distilled water and is kept in an ultrasonic device for 1 hour. Then the cloth is put into the solution for 45 minutes, at a temperature of 100ºC, and is kept on the magnetic stirrer. Then the cloth is kept in an oven at 70ºC for 2 hours, untill the cloth is dried. After this step, hydrogen sulfide is mixed with 50 ml distilled water and placed on the heater to reach boiling point; the cloth is put into the solution for 45 minutes. Then the fabric is placed in the oven for 1 hour at 70ºC for it to dry. In this part, the distilled water solution and hydro-chloric oxide is prepared so that the pH value is between 3 and 4. 100 ml of distilled water is added along with one drop of hydro-chloric acid to the solution, the fabric is then placed inside the solution and the container is kept in an ice bath and is stirred for 30 minutes with a magnetic stirrer. Afterwards, 8 grams of $FeCl_4$ and 4 to 5 ml hydrochloric acid is dissolved in 50 ml of distilled water. This is later added drop by drop into the container with the fabric. Then it is stirred for 4 hours in the ice bath. Later, the fabric is washed in 5% hydrochloric solution (14 ml of hydrochloric acid and 86 ml distilled water). Finally, the fabric is kept in the oven at 70ºC for 2 hours for it to dry.

6.3. Process and Implementation of the Design

These designs have been inspired by stencils of Iranian designs (Qajar period). Designs are printed on satin fabric by digital printing, and afterwards one can see its implementation.

Fig 7 Painting of the husband and wife of the court during Fathali Shah Qajar

Fig 8 Portrait during Zand and early Qajar in Fathali Shah Dynasty

Fig 9 Painting of the husband and wife with hand on the shoulders with glass of wine during Qajar period

Fig 10 Portrait during Zand and early Qajar in Fathali Shah Dynasty

Fig 11 Painting of Fathali Shah by famous painter Mehrali in 1810 at Negarest, Tehran

Fig 12 Painting of wedding ceremony at the background integrated with husband and wife image in Qajar period

7. Conclusion

According to the stated issue, and implementing ancient Iranian designs on ties, creating a design using light along with a conductive fabric of carbon material, provides us with the ability to use technology for designing. In this study, fabrics are manufactured using conductive carbon material, and the design is distinguished by light. Therefore, the main aim of the study was to make fabric conductive for designing on clothes, especially ties. Also, using Iranian design on the tie has been achieved.

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A Comparative Study of the Altar Design Content of the Jame Mosque and the Vank Church of Isfahan

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Abstract

This study aims to examine the design of the altars of the Jame mosque and the Vank church of Isfahan and explicate the similarities and differences of the two structures. The present comparative study shows that the aesthetic expression and visual art are different in the Islamic and Christian art. This means that the Islamic art lays more emphasis on isolated elements rather than tangible elements and the reality. This arises from the beliefs and Islamic teachings based on reluctance to iconography. In contrast, the creation of art is objective in the Christian art. On the other hand, both religions, despite their differences, have mysterious formal expressions in their manifestation. In this study, in addition to document collection for the written source, field survey, personal observation and photography of the mentioned altars have been conducted. The study results and comparison of the altars showed that religious beliefs have a significant role in the altar of the Jame mosque and Vank church of Isfahan. The Islamic art in comparison to Christian art has led to abstraction and avoidance from any portraits and iconography, while in Christianity, imaging and visual art are organized based on incarnation of God. Thus, expression and excellence in the Islamic art is the replacement of embodiment and reincarnation in its Christian counterpart.

Keywords: Altar; Jame Mosque of Isfahan; Vank Church of Isfahan

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1. Introduction

The architecture structure of church and mosque has its own unique psychology, each of which having explanation and justification of humanity-religion for the followers of the school. The altar is one common space between the two locations. A comparison and evaluation review of the similarities and differences of the architectural element in two religions (i.e., Islam and Christianity) clarifies the importance of divine religion in believers' education. Altar as the heart of mosques and churches has a special concern to the designers and builders of these structures during the design and construction process. Generally, the altar is not an independent space but rather it is sign and direction. That means the purpose and direction of human is the same. In this study, a comparison has been made between the altar decoration and the similarities and differences of the Jame mosque and the Vank church of Isfahan.

2. Research Methodology

This study is conducted using a descriptive-analytic method, by which the content of the altars of Jame mosque and Vank church are compared. The sample populations are the altar motifs of the Jame mosque and Vank church of Isfahan. The data analysis method is qualitative based on the arabesque recognition, decorative molding of the mosque altar and painting decoration on the altar of the church. The analysis aims to compare the altar design content of mosque and church. The difference of this study with previous research is that the researcher has made an attempt to implement the comparative content between the altar motifs of the Jame mosque and the Vank church of Isfahan. The similarities and difference have been examined in terms of the concept of altar of mosque and church.

3. Review on Altar Decoration and Motifs of Isfahan Mosque

In a few references, the number of the altars of the Jame mosque is nine, while 14 altars are actually seen. The fact that the altars have survived provides useful information for the researchers (Shateri, 2013: 69). The 14 visible altars of Jame mosque are located in south, east and west, while there is no altar on the north side of the mosque, which is justified based on the location and application of this side (aligned with Mecca) (Hatem, 2000: 19). In other words, it indicates the non-religious function, which pertains to the ritualistic ceremonies, justifying the absence of altar on this side. Among these three sides, most of the altars are located on the south and some to the west side of the mosque. Different materials and numerous decoration methods are implemented to construct the altar of mosque. In total, six altars are made of tiles, five altars with stone and three altars are made of plaster. However, in construction of some altars such as the one under the dome of Nizam-al-Mulk, there is the combination of tile and stone; because most of the space of the altar is occupied by tile, the altar has been changed into a tile altar. It should be noted that the main altar was made of brick during the Seljukid era about 1000 years ago when Malikshah of Seljuk ruled the city. The adjacent yard altar of Nizam-al-Mulk has also been classified as a stone altar and was decorated with small pieces of mosaic (Shateri, 2013: 70).

4. Vank Church Altar and Motifs

The altars of the church are located on the eastern side on a raised platform as compared to the rest of the building, with a rectangular chamber on both sides. Under the altar there is the tomb of the church founder (David Caliph) and the father of Iran's printing industry (Khachator Gesaratsi

Caliph) (Houspian, 2007: 74). All positions are toward the altar and the main entrance opens in the altar. Location of the altar is to the east side related to the belief that Christ will appear from the east. In fact, altar is the turning point and target pathways in the church. Altar as a platform to maintain its privacy is separated by five steps on either side. The altar has an arched ceiling with basement where the two mentioned religious leader's tomb are built and because of this reason it is a holy altar. To pay tribute to these two great people, they are buried under the altar. The altar elements include cross, candlesticks, holy book (the Bible) and curtain. Two rooms on either side of the altar are particularly for the priest to organize events (Memarian, 2008: 165).

In the church altar, large 3 x 5 meter posters are installed on firm stone slate. The oil painting poster on the canvas is related to the first half of the 17th century. The poster theme is the ascent of Jesus Christ. The painting has a golden decorative border (Ghazariyan, 2014: 178). The colors used are purple, cobalt blue, red, orange, yellow, green and brown. The yellow and gold color depicts the sanctity around the head of Jesus Christ. In this painting, Christ is riding on a dense bright red cloud for infinite heavenly fly. The inscriptions on the two sides of the altar are the photos of Apostles painted on the golden background and there is no symmetry on the two sides of the poster. Around the altar, golden plaster work projection with blue background is observed. This is Iranian style molding considered as a decorative technique during the Safavid era. This molding includes arabesque and plant design (Nazariyan, 2014: 136).

5. Altar Similarities and Differences of the Jame Mosque and the Vank Church of Isfahan

Inscription: Quranic inscription and holy names are seen on the altar wall of the Jame mosque, but there are no Quranic inscription seen in the altar of Vank church. Fig 1 shows the examples of inscriptions. The inscriptions in the altar of the Jame mosque of Isfahan represent the importance of Quran and its influence in the life of people. Often, these inscriptions are linked with arabesque patterns. The presence of a variety of Kufic and Sols calligraphy and the floral and greenery decoration with a variety of colors, as well as the geometric patterns all indicate the plant of life twisted to the trunk of reality.

Iconography: In the altar of the Vank church, human motifs are used such as the face of Jesus Christ, the Virgin Mary, the Apostles, Jacob, Prophet Yunes, angels, the Holy spirit. (fig 2). However, in the altar of the Jame mosque of Isfahan there are no traces of human paintings, which are considered sinful on the walls of the mosques in Islam. From the very beginning, Islam, with the exclusion of paintings of living creatures especially human figures, gave ways for a variety of performing art and creating new decorations (Avini, 1991: 901). In fact, one of the unique features of the Islamic art is prohibition of the depiction of human and animals. One of the most important Islamic principles is rejection of any imaging and sculpture on monotheism. The first consequence of rejecting the imagery is the forbidden of idolatry (Fuladvand, 2008: 896-897).

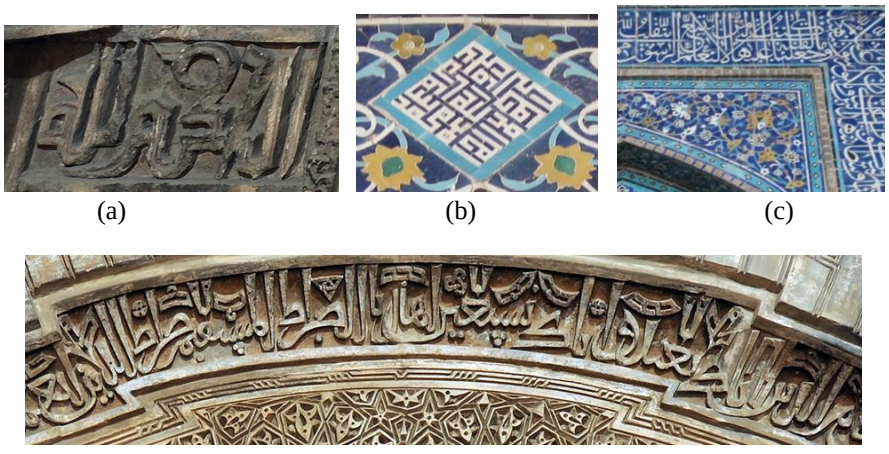
Calligraphy: The art of calligraphy has been used in the altar of the Jame mosque but there are no work of calligraphy in the Vank church. In Islam, the art of calligraphy is sacred; in the Christian art, iconography has the same status. In Islam, calligraphy depicts the visible object of words of God, but in Christianity the divine truth is embodied based on the principle of incarnation of Jesus Christ seen as the complete man. In fact, calligraphy is an integral component of Islamic Iranian architecture and the differentiation factor is from the Cathedral architecture.

Amongst the Islamic arts, calligraphy has the closest relationship with the word of God and noblest visual art in Islam. This art has a natural propinquity with the spiritual reality of Islam; that is why calligraphy is used for decorating altars.

Fig 1 Inscriptions in the altar of Uljayto in the Jame mosque of Isfahan

Fig 2 Iconography in the altar of Vank church (source: www.tebyan.net)

In Christianity, the art of iconography has a relation with Christianity and hence in churches only iconography is allowed (Vaseei, 2012: 15). Inscription in the altar of the Jame mosque plays the same role as the iconography in the Vank church altar. In the altar of the Jame mosque, there is abundant use of Kufic, Mohaghegh (preliminary Naskh), Banaee and Sols calligraphy. The Kufic calligraphy is compatible with any material such as stone, plaster, brick and tile, giving satisfactory results that can be seen in the altar of the Jame mosque (fig 2a). In the Banaee calligraphy, which is also known as Moaghali calligraphy, both black and white can be read that means the black calligraphy is read as something and the white as something else. This is the art of Banaee calligraphy (Madadpour, 2008: 135). This calligraphy line includes sacred words like Allah, Mohammad (pbuh) and Ali (pbuh) and covers shapes such as squares and other geometric shapes, for example the altar of Ostad porch in the Jame mosque of Isfahan (fig 2b). The implemented Sols calligraphy has curve lines; according to the rules and regulation, it is the most difficult, complete and beautiful calligraphy in Islam created via repeated vertical and large hammed letters and induced great glory (Vaseei, 2012: 15) (fig 2c). The Mohaghegh calligraphy has been the most popular calligraphy over four centuries among the calligraphers of Quran in the entire east Islamic region. The effect of Iranian talent in this calligraphy is obvious. The Mohaghegh calligraphy is magnificent, and large letters with regular spacing can be observed, uniform and simple (fig 2d).



(a) (b) (c)

(d)

Fig 3 a) View of the east corridor altar of the Jame mosque of Isfahan with Kufi calligraphy. b) View of Ostad porch altar of Banaee calligraphy. c) View of dome house Nizam-al-Mulk altar with Sols calligraphy. d) View of eastern corridor altar of the Jame mosque with Mohaghegh calligraphy.

Decorative motifs: The decoration of the altar of the Isfahan Jame mosque includes brickwork, molding, tiling and carving; however, in the altar in the Vank church, the major part of decorations painted is on plaster and oil paint and there is no use of carvings, brickwork and molding. But around the plinth of the Vank church altar like the altar of the Jame mosque of Isfahan, tile work decoration has been used both related to the Safavid period and in both places seven colored tiles are used. On the tiles, there are repetitive patterns of leaves and floral and similar colors in both such as yellow, white, blue and green; however, a lot of differences also exist in both tiling such as the Vank church altar tile motifs of angels dressed in long skirts with bouquet of flower in their hands. In none of the tile motifs of the Jame mosque altar, images of angels and humans are seen; instead, Quranic verses with white color written on blue background and more turquoise clay tile, Persian blue and turquoise mosaic in "Sun" design framework, torpedoes' mouth arabesque and elephant trunk are used. The dominant color seen in the tile work altar of the Jame mosque is Persian blue and turquoise blue.

In Islam, one way to decorate the altar is painting; due to the sanctity of altar, the colors used in this regard are selective. In the Hadiths of the Prophet some colors such as green and white are glorified whereas the black color is disapproved. The blue color has been abundantly applied in the tiles of the altar of the Jame mosque and depicts wide clear sky and sign of peace and innocence. Blue means faith and refers to the infinite space and spirit. For eastern people, blue is a symbol of immortality. The ancient people regarded turquoise blue as sacred. According to them, the turquoise color increases the eye vision, eliminates infertility, enhances self-esteem and has a role in overcoming the darkness (Sajjad, 1993: 230). Besides the stunning colorful decoration work, the Iranian designers were well-known for the value of white color. In the majority of the altars of the Jame mosque, white color has a good influence in the work, which also increased due to its neighboring blue color. The other difference in the design of the two building is the use of geometric design, mathematical shapes and images such as circles, hexagon and triangles in some altars of the Jame mosque (e.g., Ostad porch). Yet in the Vank church altar, there is no work of geometric shapes. Due to this reason, Muslim artists have used geometric art that is a replacement for the banned human and animal images. The abstract geometric shape is used in some altars of the Jame mosque of Isfahan and has encouraged Muslims to spiritual thinking, while such images in the altar of the Vank church lead more attention to the existing incentives rather than the God willingness. Therefore, geometry became the basic fundamental component of Muslim art which allowed artists to freely use their imagination and creativity (fig 4 a-d, tiled motifs of altar of the Vank church and the Jame mosque shows the differences).

As previously stated, another difference in the decoration of these two structures is carving. In the Jame mosque of Isfahan, exquisite marbles are used (e.g., the altar of the Nizam-al-Mulk dome, the altar of both side entrances of the Nizam-al-Mulk dome, and the altar of the Shagerd porch). In some stone altars, the carved decoration in the central part is composed of a large plant pot with abstract elements of the plants elevated as bergamot. This decoration is a symbol of Tuba tree. Another striking difference noted in the two structures is elaborately decorated molding altar of the Isfahan Jame mosque that has used crowded arabesque patterns and the base with geometric motif, floral motif, snail-shaped leaves and Quran verses, while in the Vank church altar, there are no traces of molding.

The molding includes arabesque and plant motifs along with beautiful Quran inscriptions. The stucco façade is one of the main elements of Iranian architecture arrangement that has been used in altar of the Jame mosque with the highest level of innovation, for example in the Uljayto altar or the east side altar.

Mogharnas is one of the beautiful decorative Islamic arts used in Omar platform altar in the Jame mosque. However, in the altar of the Vank church inspired by Christian art, Mogharnas has no role. Mogharnas is one of the decorative elements of Islamic architecture that plays an important role in aesthetics of Iranian buildings especially mosques (Fuladvand, 2008: 402). The colors used in the altar of the Jame mosque of Isfahan are cool and bright (blue, turquoise, white, etc.). But colors used for the altar of the Vank church are hot and warm colors (red, yellow, black, etc.), and turquoise, blue or white colors are rarely seen. Lots of gold work is used in the altar of the Vank church but it is absent in the altar of Jame mosque. Table 1 shows the summary of the structures of the two altars been compared.

(a) (b) (c) (d)

Fig 4 a) Plinth tiled motif of the Vank church altar (angel motif, floral with white background) (source: www.goodreads.com). b) Tiled motifs altar of Nizam-al-Mulk of the Jame mosque (composed of mosaic, Quran verses, plant motifs and arabesques). c) Tiled motif altar of the Ostad porch of the Jame mosque (composed of torpedoes' mouth arabesque motif, and elephant trunk in the mosaic mold, geometric design, Sun, Quran verses). d) Northern corridor tiled altar of eastern porch of the Jame mosque (composed of six petal mosaics).

Table 1 Comparison of the altar of the Vank church and the Jame mosque of Isfahan

Comparison	**Altar of Vank church**	**Altar of Jame mosque Isfahan**
1. Construction time	Safavid	Safavid, Teymuri-Patriarch
2. Implementation technique	Painting on plaster and canvas, gilding, polychrome tiles	Brickwork, molding, carving, inscription, mogharnas, polychrome tiles, mosaic
3. Decorative elements	Iconography, plant and arabesques motifs	Calligraphy, Quranic verses, holy names, geometric patterns, plants and arabesques motifs. Tuba tree, sun pattern, bergamot
4. Colors	Dark and light blue, Persian blue, red, yellow, gold, pink, green, purple and brown	Persian blue, turquoise, white, yellow and green
5. Language entries	Armenian	Arabic, Persian

6. Discussion and Conclusion

As the largest base for artwork, Islam and Christian religions have offered a particular purpose to religious art. The evaluation of similarities and differences of the altars of the Jame mosque and the Vank church of Isfahan and the applied art in these altars clarifies the fact about the impact of spiritual beliefs, religious teachings and artistic motivations. It is clear from the comparative study conducted on the altar of the two structures that aesthetic expression and visual art are different in Islamic and Christian art. In Islamic art, emphasis is on isolated elements more than tangible elements and reality that arose from the beliefs and Islamic teachings based on reluctance to iconography. In Christian art, the creation of art has an objective dimension. Hundreds of years

have passed since the construction of the Isfahan Jame mosque; the most important development project was in the Aleboyeh period and then in the Safavid period. The Vank church was built in the Safavid period. Since both structures were built in the same period, it could be the reason for the similarities and differences, which can serve as a factor for the comparison of these two religious structures. The church altar symbolizes the presence of God and recalls the sacrifice of Jesus; the steps symbolize the divine and spiritual climbing toward Jesus. The altar is located toward the south, while the churche altar is located on the east and this is derived from the Christian faith. In the mosques, most of the decorative motifs are based on plants. The decorating style used in the altar of the Jame mosque is tile work, moldings, carvings, inscriptions and calligraphy as Arabic text. The colors in these places are blue and turquoise blue. These colors, especially turquoise blue are eye-catching and a symbol for heavenly peace and spiritual space for the Muslims. These spaces and colors provide more comfort to the people. In the mosque's decoration, special rule exists and the western style is anti-religious ornament that is not allowed.

It can be concluded that the common religious art is the symbolic aspect. The symbolic language is the language of religious art that expresses the inner concept. Concepts that are not expressible can be conveyed through a symbolic format. The Islamic and Christian art uses a symbolic language to express such concepts. Symbols used in each of these two arts are different according to their beliefs. Quran and other holy books like the olden and present time express the spiritual truths spoken in secret languages. By comparing the altar of the Vank church with human images and icons used in the altar of the Jame mosque, one can judge that the Jame mosque gives the presence of heart to the human.

Similarities of the altar of these two structures is the presence of holy signs; in the altar of the Jame mosque are Quran verses and holy names, while the altar of the Vank church are murals with themes of Jesus Christ. Using polychrome tiles is another similarity. The tiling method is same for both structures because both belong to the Safavid period. The type of icon (i.e., human or animal) and yellow color tone on the altar of the Vank church leads to the tiling difference between the two structures. One more difference is the use of colors in both structures; the Vank church has hot and warm colors while the Jame mosque has cool and bright colors. The blue color, because of peace and silence, has a special application in the murals of Christian religion and Islamic structure. Blue color displays faith, trust, modesty and resistance. Another difference is the presence of sun in some altars of the Jame mosque which has been considered for years by the artists. In the Islamic art, sun is inspired by the circular design with an arabesque pattern, inscription and geometric design. This icon has a lot of meanings; hence it is known as a symbol of divinity and oneness light.

The obtained results showed that Islamic art in comparison with Christian art has led to abstraction and avoidance from portraits and iconography, while in Christianity visual and sculpture art is organized with bases of incarnation of God. Thus, expression and excellence in Islamic art has been replaced for embodiment and reincarnation in Christian art. Finally, it must be said that despite large differences in both structures, both have spiritual dimensions and their decoration does not reduce the spiritual impacts; indeed, it mostly has a symbolic aspect observed in churches and mosques with its simplicity reaching high mystical and spiritual levels.

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Aesthetic and Symbolic Analysis of the Manuscript Illustration Alexander the Great (Sikandar) in Conversation with WakWak Tree (Talking Tree) in Shahnameh Demot

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Abstract

Combining Persian miniature and literature together has been influential in the recent decades. Illustrated Shahnameh Demot (Book of Kings, Great Persian Epic), which is known as the most valuable illustrated artwork in the first Tabrīz school, is considered to be the special style of Persian Illustration or Miniature during Mughal Ilkhanid era, taking advantage of interaction between literature and painting. This article attempts to examine artistic and visual qualities of the illustration "Alexander the Great (Sikandar) in conversation with WakWak tree" in Ilkhanid era. A descriptive-analytic approach is used to investigate the interaction between literature and illustration. The research results indicated that the tree is a concept existing beyond human mind, and that it is embodied through symbolism. In Shahnameh, WakWak tree or Talking tree is a symbolic tree where Alexander is in conversation with WakWak tree and the tree foresees his future. As the art is always influenced by the ideology underscoring the era, it could be alleged that mythological thought has been influential in the artistic structure of illustration, and it has been turned into an aesthetic language that has led to the reflection of the evolution of poetry in the illustration. In this illustration, by the adept composition of the debates raised, Ilkhanid illustrator subtly abducts the image from the heart of poetry, and intertwines his capabilities and potentials with words of poetry, such that visual symbolism and color, in keeping with the themes of Shahnameh, are some of the most important features embodied in the elements underlying the illustration.

Keywords: WakWak Tree; Shahnameh Demot; Persian Miniature; Ilkhani Era; Aesthetics; Symbolism

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1. Introduction

One of the works remaining from Ilkhanid era is "*Shahnameh Demot*", that dates back to Mughal Ilkhanate (The Ilkhanate, is also spelled Il-khanate as a breakaway state of the Mughal Empire, which was ruled by the Mughal house of Hulagu). Shahnameh Demot is the oldest and one of the most magnificent illustrated Shahnamehs (Book of Kings) which is remained from the ancient days. The manuscript was composed in honor of Sultan Bin Ali Al Owais, who was one of Al-e Jalaye princes. Al-e Jalaye and Al-e Muzaffar ruled in southwestern Iran. Out of the manuscript illustrations in the book that were adorned by the beautiful Naskh script, only a few folios have survived. Shahnameh Demot was preserved in Golestan library until the era of Mohammad Ali Shah Qajar, but it was taken out of the country due to the unrest and the unstable situation underlying the era, and one of the antique dealers in Paris was able to become its owner. Some pages from the illustration were sold separately, and the folios lacking illustrations were destroyed. Only seventy two folios of this illustrated manuscript have survived in the museums of the world. Shahnameh Demot was composed following the Seljuk school, as the earliest school of manuscript illustration in Post-Islamic Iran.

The book dates back to the era of Moghul Ilkhanate who founded the school of Mongolian (Tabriz 1) within the period of the 7^{th}, 13^{th}, and14^{th} century AD. One of the illustrations present in the book portrays the image of Alexander the Great and WakWak tree (i.e. talking tree). Alexander converses with the tree and the tree foresights his future. WakWak tree is a symbolic representation of some ancient concepts and notions. In the illustrations depicted in the book, the beholder can see the coalescence of Pre-Mongol Persian and Mesopotamia traditions with the traditions of the Far East. In some cases, one has superiority over the other and can represent a portrayal of the climax of Ilkhanid painting. In Shahnameh Demot, although Chinese elements can be seen in the illustrations, experimentation in landscape portrayal, and blending the sights and integrating them with the national spirit has paved the way for the liberation of outside influences. Generally, realizing that ordinary language is unable to convey genuine experiences, the poet inevitably takes advantage of bizarre, cryptic, symbolic, and mythological language in order to convey emotions and sensations. In the field of symbolic expression and imagery, sometimes icons and symbols turn into humans and sometimes humans transforms into icons and symbols. Then, a kind of pantheism is created in which a sense of man's identification with plants and nature in light of symbolism is manifested. For example, tree acts as the genuine reflection of man and his deepest aspirations. The allegoric image can generate countless codes that can be expanded in numerous branches, and come into existence within the context of mythology, arts, and various civilizations. Delving into the imagination realm contributes to the main sources of human history in which the image of sacred trees can bewitch and charm the eyes. The trees include the holy tree, tree of life, talking tree, and WakWak tree as a tree with human and animal fruits. Therefore, the current article seeks to find answers to the following questions:

How the characteristics of Shanameh's literature in "Shahnameh Damut" have appeared in visual elements of the illustration "Alexander the Great in conversing with talking tree"? What would be the visual and artistic relation of this work with the manuscript illustration art in the Ilkhanid era? How have "WakWak tree (talking tree)" motifs in terms of aesthetics, semiotics, and mythical concepts been presented in Shahnameh Demot?

2. Literature Review

A number of researchers have considered different aspects of Ilkhanid illustrations. Accordingly, in an article entitled "Wak principle in Persian painting", Azhand Yaeghub (2009) analyzes the emergence and formation of different types of Wak paintings, especially their presence in Persian manuscript illuminations. Rabii Somaye (2012) in his master's thesis entitled "A review of Wak's decorative motifs in decorative art" concludes that ever since the sixth century, these motifs have been represented as an important decorative motif in the works created in Muslim countries. In an article entitled "Image and concepts of talking tree on handmade rugs", Mahla Takhty (2012) examines the illustration of talking tree on hand-made rugs in different periods. In an article entitled "Sacred tree, WakWak tree, and the trend of formation", Alireza Taheri (2012) discusses the talking tree and the formation of Wak motifs". Reza Asl Najafi Fard (2013) has authored an article entitled "Brief history of Persian-Islamic illustration in different eras of Persian art", and presented it to the art centre of Zanjan Province. In this contribution, different post-Islamic schools which have emerged in Iran are reviewed, one of which is the first Tabriz school or Mongolian school, relevant to Ilkhanid era, and of the most renowned books in this period is Shahnameh Demot. There is also a thesis by Akram Jannati (2015) called "Illusionism in the motifs of Persian rugs with a focus on talking tree". Relying on a library study, the current descriptive-analytical research seeks to analyze the content and structure of an illustration taken form Shahnameh Demot, and also to present an analysis of the ambience underlying the work and its visual elements, based on some complementary issues such as Ilkhanid era (Tabriz school), Shahnameh Demot, WakWak tree, and Alexander the Great.

2.1. WakWak or Talking Tree

Talking tree is one of the sacred trees with deep roots in mythology of the Oriental and Western nations. This imaginary and mythical tree grows on an island called "Wak Wak." The tree has human-shaped fruit, which after the fruits are ripened or when the wind blows, the sound of "Wak Wak" can be heard. The fruits on the tree speak the same way as humans. The stories regarding the trees are the origin of the motifs which emerged in the artistic works created in the Oriental lands such as Persia, China, and India, and also in the medieval era in Europe (Taheri, 2012). The coalescence of animals and humans with plants and trees may stem from the belief that birds and animals that settled or appeared among the foliage and flowers of the trees communicate with the tree components. Howling sound of wind and the production of inaudible sounds create an illusion of the trees' potential to speak. These imaginations can act as the source of inspiration for imaginary legends and tales, and on the other hand, they also affect the artist's creative mind.

2.2. WakWak Tree Built upon Different Expressions

WakWak tree has been given different terms, including 'vaghvagh', 'vagvag', etc. In Persian dictionaries, the term "WakWak" is referred to a mythical and illusionary tree that blossoms at dawn and fades at the evening, and it is narrated that its fruit is in the form of talking humans and other animals (Khalaf Tabrizi, 1684). In Dehkhoda Persian dictionary, it is said that "WakWak" is a tree with the ability to speak (Dehkhoda, 1995). In Amid Persian dictionary, "vagvag" is a legendary tree with human-like fruits that emits human-like sounds. In another form, in a book entitled "Al-Hayvan" (Jahez 9th century AD), the relevant tree is expressed in the form of "WakWak", representing the creation of animals and women who are hung from head on the trees.

The suspended women consistently emit the voice of the tree unless they are detached from the tree, leading to silence and death (Fig. 1).

In the geographic book "The Ḥudūd al-ʿĀlam" (Pishabouri, 982), regarding vaghvagh, it is said that the tree is a Chinese tree similar to almond and cucumber trees, with the fruits resembling a man's face. When the fruits of the tree come to fruition, some voices similar to vagh vagh can be heard several times (Anonymous, 1967).

Fig 1 Manuscript, Al-Bolahan, WakWak tree with human fruits hung from head and bulbs blooming with human beings. (Source: www.androphilia.tumbir.com)

2.3. Mythical Analysis of WakWak Tree

Presentation of the talking tree in fairy tales has several versions. According to one of them, the exotic tree, whose branches carry the heads of the sons of Adam is located on a remote island. At the time of sunrise and sunset, they scream "WakWak" and sing religious melodies conducted by the creator of the universe. According to the creators of these legends, this tree with a full body of a woman and voice of WakWak is an omen, and the story is narrated in marvelous Hindi books.

2.4. Reflection of Talking Tree in Shahnameh Ferdowsi

Literary and epic narratives and poems in Shahnameh Ferdowsi are a blend of facts and fiction that were highly appreciated by kings, scholars, and historians, and have been illustrated by Iranian artists in different ways and at different times. Ferdowsi's reference to talking tree in Shahnameh is a testimony to how deep-rooted this myth is for Iranians. Ferdowsi in Shahnameh dramatized the

myth of talking tree and Alexander the Great. In Shahnameh, "Talking Tree" is renamed as "Gouya Derakht" (Eloquent Tree), and is located at the end of the world. The tree trunk is composed of both man and woman, and its fruits have heads that can predict the future (Taheri et al., 2011).

3. Analysis of Alexander's Conversation with Talking Tree in Shahnameh

One of the narratives and epic poems of Shahnameh Demot is the visual masterpiece of Alexander the Great in conversation with the Talking Tree. In this beautiful illustration depicted in Shahnameh, dating back to Ilkhanid era, the tree narrates Alexander's fate. In the scene, the Talking Tree is represented by human and animal heads, and among the animal heads, the heads of dogs, antelopes, foxes, and rabbits are observed. Narrating the Talking Tree story, Ferdowsi states that Alexander on his journey reaches a city whose people speak of a wonderful and exotic tree grown in the form of two (male/female) talking trees. The male speaks during the day and the female talks during the night. Alexander and his companions seek to visit the tree, and as the sunset approaches, the king hears human-like voices among the trees, and he becomes perplexed and asks the translator what the tree recites, and why does it murmur so strangely? The translator replies that the tree says that the kingdom will soon come to an end that we should leave, which makes the king embarrassed. In the middle of the night, another tree speaks; Alexander asks, 'what it is saying?' The translator answers that the tree says: 'Why there is so much suffering in the world, and why are you so zealous to conquer the world and kill people?! Someday you are destined to forsake the kingdom and you will lose all the grandeur of your reign' (Dehkhoda, 1995).

4. Analysis of Talking Tree from the Perspective of Myths and Artworks

One of the main manifestations of myths is works of art. No matter if these works have been eternal because of their mythical content, or if myths have been eternal due to the presence in the works that deserve eternality, the elements present in myths and artistic works can be analyzed individually or collectively. The notion that the tree can generate humans was embodied in some cultures in the form of men hung from trees or suspended among the tree foliage or branches as fruits. Of course, the notion of human procreation of the tree also led to the birth of various animals. Real animals such as goats, lions, snakes, and mythical creatures like dragons and demons, along with a variety of birds were also born from the trees known as Talking Tree in fictional and folk literature and art.

5. Analysis of Illustration

Seljuk era has been considered in examining the early illustrations of Talking Trees. In this era, the predecessors applied motifs in artistic media. Seljuks' lifestyle was tribal and nomadic and closely interlinked with nature. Humans, animals, and other natural manifestations such as flowers, mountains, trees, etc., were considered by Seljuk artists as tangible and justified manifestations. Seljuks sought to reflect these elements in the artistic works ranging from textiles to architectural designs. Since Seljuk era onwards, artistic decoration and ornamentations found broader applications. Humans and animals, along with flowers and plants, found pleasant motifs, and idealistically found their way into decorative artistic terminology (Azhand, 2009).

At the time of Ilkhanid dynasty, with the introduction of Chinese elements into Persian painting, the paintings were depicted with special features. This contributed to the formal expression of clouds and mountains, clothing decorations, and accuracy in details, all of which can be also observed in Alexander scene. In this illustration, while acknowledging adoption of new elements

which can give a new insight into his works, the artist has mixed the elements with traditional Persian painting in such a way that it would be difficult to discriminate them from the fabric of traditional art. In fact, new elements are incorporated in Persian style in a way that it does not impair the continuity of the Persian illustration art. Animals and humans are fused and combined in a manner in which they are intermingled and synchronized with the tree parts. Wind wrapping and inaudible sound create an image of trees' potential to speak. These illusions can be sources of inspiration for myths and legendary tales, and on the other hand, they can influence artists' critical depiction of them. This stage is a representation of artists' lofty intellectual status and the most important measure to evaluate art works at the higher level, it also incorporates combinations of shapes, colors, textures, and coordination of them with one another.

Most of the outstanding works created in human history have been more successful at this stage than other works. The composition of a work reflects the artist's capability to express their thoughts, points of view, and unique outlooks. Achieving a harmonious fusion and a unified composition is the result of scientific and practical experiences in the field of art. Grasping the intended meaning in a visual phrase depends largely on the type of composition (Donis, 2006). Structural differences between various subjects can be seen in illustration compositions. Unlike epic paintings, in mystical ones, there is no trace of good and evil, thus the forms applied lack contradiction. The application of these forms in the latent geometry of a work can contribute to softening the ambience and unification of illustration. Helical compositions can be further observed in these works, and simplicity and purity are two major features of these works. These elements are applied in the illustrations in such a way that they can infuse peace and stability, and such peace and stability are created in different ways. The main theme and key elements of the illustrations are normally emerged in square frames to underline peace and stability. The signs present in these paintings prove the presence of the square. Subject differences in the effective combination of the paintings play an effective role, and restrict the artist to select visual elements of form, texture, and color. Human life heavily depends on the presence of plants. Symbols and signs of such presence can be observed in mythical narratives and a variety of magical rites, religious rituals, religious and national celebrations, and civilization manifestations (monuments, visual arts, decorative objects or objects of everyday life) (Fazeli et al., 2013). From the perspective of Ferdowsi, there is an unconscious continuity between the tree and the story. In the illustration "Alexander and WakWak Tree", there is a symbolic tree in Shahnameh that Alexander converses with, and the tree foresees the king's future. Shahnameh's Talking Tree has two foundations, including masculinity and femininity that foresee Alexander's death. The tree's verbalization originates from ancient people's animistic beliefs. They believe that, like humans, a tree is a living organism, which possesses consciousness and understanding. Thus, from their perspective, tree's ability to speak was not queer or amazing. This animism can also be seen in other elements of nature. Mythical Chinese people believe that ancient cypress trees can speak (Dariush, 2013). In Fig 2, the depiction of twisted and knotted trunk of a tree, and carefully drawn plants and organs of horses borrow from the elements of Chinese art. In all the works of this period until the arrival of the School of Isfahan, a kind of mobility and movement could be observed surrounding the illustration elements. Mobility and movement, as two elements emanated from Chinese art (injected into traditional Persian art), can be observed in the illustration in the movement of the horse's feet, and the rhythm and form of the leaves. According to Fig 3, the figures depicted have resemblance to the Mongol figures, and some expressionless faces present in the illustrations, with certain exaggerated movements in the past illustrations, have more or less survived. However, scenes have become spatially broader. Backgrounds may not always have the appropriate scale for events, but they effectively carry the

heroes' powerful body, and the figures are still located in the most of the image ambience. Undoubtedly, the illustrators of Shahnameh Demot are indebted to Ferdowsi's poetry in achieving such an epic expression. According to Basel Gary, "The powerful illustration style, is the aftermath of the inherent conflict between Persian culture and the skills acquired from Chinese art tradition" (Pakbaz, 2001). In the illustrations, among the elements of visual arts, the scripts play a major role in the emotional expression and display of the images. In the form of ghalamgiri, outlining, and thickening the scripts, the scripts can underscore the prominence and consistency of peripheral images. In Shahnameh Demot, more than any other illustrated manuscript in Ilkhanid era, the emotional state of the figures in the illustrations is represented. The margins of hills and rocks are depicted with soft curvature.

Fig 2 Alexander the Great in Conversation with WakWak Tree, an illustration derived from Shahnameh Demot, 1330-1340 AD; Ilkhanid dynasty, watercolor, ink & gold on paper; Freer Gallery in Washington. (Source: www.freergallery.com)

a b c

Fig 3 a) Alexander the Great in Conversation with Wak Wak Tree b) Portrait of Emperor Shenzong (r. 1067–1085) by anonymous song artist. c) A hanging-scroll portrait painting of Emperor Taizu of song (r. 960–976), founder of the Song dynasty, painted by an anonymous song artist. (Source: en.wikipedia.org/wiki/Emperor_Shenzong_of_Song)

What attracts the attention more than anything in this illustration is the arrangement and layout of the elements by the illustrator in a helical composition or labyrinth motion, and in a smooth and non-angular form. At the initial point of spiral movement from the inner part of the main subject, Alexander and his horse start to move, and then the movement finds an angular proceeding to the

other elements of the illustration, and the movement finally leads to the form of the Talking Tree and its roots in the soil. In helical composition, eye's movement is constantly directed towards the elements as a whole. In this regard, by arranging the helical form-based elements, the illustrator creates a powerful symbol of the concept of life that could be expressive of the progression and cycle of life. This visual expression acknowledges the fundamental subject matter of Shahnameh poetry. In terms of composition and landscape painting, the illustrators extended the scope of experimentations, and blew a new national spirit into their works. The form and the arrangement of horses in the illustration have an alternating rhythm. By implementing this rhythm, the artist takes advantage of the appeasing quality of its created space. Additionally, by creating an iterative space along with variations in the forms of the horses, the fatigue of the visual features of the illustration is reduced, and such space is harmoniously exploited. In the scene portrayed in the illustration, human and animal figures are closely connected to the context and to the environment. The concept of the scene determines the position of each individual, their physical gaits, and face gestures, in a way that the image immediately becomes comprehensible (Parham, 2008).

In terms of lighting, the illustration has an all-round lighting. Color is one of the most basic elements in the area of the Persian illustration art that can deepen and enrich different aspects of a work. Color can visually affect human spirit and soul, and can act as a means to transmit significations and associations. In terms of emotional expression, the color is one of the most powerful visual elements. In addition, color can strongly evoke symbolic significations. Based on the associations between the colors and their juxtapositions, a work of art can be interpreted in terms of subjective significations. For example, Alexander's white horse, as a critical element, is painted with a white color to find a tangible form along with Alexander's attire color. Alexander's penetrating status, as the core visual element of the illustration, can be represented by the color red. Notably, Alexander's companions and their horses are painted with grayish-like brown and cream tonality coloring, and have the same tonality as the ambience in such a way to highlight the status of Alexander the Great and his prominent role in terms of visual subjectivity. Furthermore, color coordination and harmony can contribute to greater tranquility, delicacy, and tenderness in the image. Notably, the colors applied in Ilkhanid illustration are influenced by former Persian traditions, and Mongolian and Chinese practices, in such a way that only some parts of the images are painted and some other parts are left colorless, and less diverse hues are often used. In contrast, in another group of manuscript illustrations, the traces of coloring dating back to Manichaeism and Seljuk periods can be observed. The variety of colors used in the period is more limited than the previous era, and the colors applied are mainly brown, ocher, yellow, and pale blue. Although in some illustrations the colors applied include red, green, and orange, the prominence of brown colors can be further highlighted.

Texture is a visual element that can play an important role in evoking the significations and meanings. The main contributor to context is the element of point and line. The quality of applying the two elements is effective in the tenderness or roughness of the context. In addition, in the ghalamgiri (the terms specifically applied to Persian miniature) part, lines are created either prominently or vaguely, and can influence the quality of the texture. In a work of art, type of texture and the resulting sensation can create different concepts. Consistent with the subject matter and influenced by themes, this element can affect the illustration's ambience. The application of turquoise blue background is a relic of Manichaeism and Seljuks illustration tradition. In the illustration, the sky is monochrome, and the harmonic colors and the sky's simple ambience create a spiritual state of peace and tranquility. There are different images of this conformation that can be

observed in manuscripts such as “An Illustration of Alexander alongside Talking Tree” created in Shiraz school (Fig 4).

Fig 4 The manuscript dating back to 1430 AD, School of Shiraz, Alexander the Great in conversation with WakWak tree, belong to Dalian library. (Source: www.badesaba.tunbir.com) (2016)

6. Conclusion

There are always notions beyond the human mind, which in order to embody them, man prefers to recourse to symbolism, and tree is one of these concepts. In general, tree symbolizes the living and vibrant nature of the universe, as well as its recurrent growth, fertility, development, and also the eternal, immortal and everlasting life. Through delving into the imagination world, man can fathom the original realms of human history. In such a mesmerizing realm, the image of the sacred tree can bewitch the eyes of any beholder. Trees such as the holly tree, the tree of life, WakWak Tree, and vaghvagh tree are the trees that carry human-like fruits. In general, the narrations regarding WakWak Tree have two different aspects. Some of the narrations address the concept of the Island of WakWak, and regard the tree as part of the features relevant to the island, and some other narrations underline the tree itself. The artworks known “WAKs” were manifested in various ways in Persian art works concurrent with the arrival of the tribes from Central Asia into Persian territory, and in the 12th century AD and the Seljuk era. In addition, since the 14th century AD, the Waks gradually transformed into one of the fundamental aspects of Persian painting. The most important narrative present in Persian literature regarding WakWak Tree is “Alexander’s Conversation with the WakWak Tree” which is also reflected in Shahnameh Ferdowsi. Illustrated Shahnameh Demot is one of the most valuable illustration artworks created in the Second Tabriz School by Persian artists under the rule of Mongul Ilkhanid. Given the fact that manuscript illumination and illustration was highly appreciated and sponsored by the kings of the time, the illustrations portrayed in the book are the climax of the development of Persian illustration and miniature in the Ilkhanid era. The results obtained from the current research show that this precious Persian traditional illustration pays much attention and care in depicting human emotions in illustration, and can be considered a completely new breakthrough. The illustration represents

Alexander's arrival to the end of the world where WakWak Tree is depicted carrying heads of women, men, and animals. The composition style in the illustration and the arrangement of its visual elements including shape, color, and texture are influenced by the underlying subject matter. The illustration's composition evokes stability and equilibrium, and the illustrator has sought to refer to the intended theme, using different associations and evocations. In the form of myth and symbolism, the illustrator presents a portrayal of the artistic ambience, underscoring the period alongside the themes which underline the epic and mystical subjects hidden in Shahnameh. In general, the illustration of WakWak Tree is loyal to two realms. Firstly, the book whose text is portrayed and illustrated by the illustration; Secondly, WakWak Tree, which is portrayed using symbolic animal- and human-like images, and its painting style is a coalescence of the Seljuk and Ilkhanid era, with the preservation of the identity of the illustration traditions dating back to that era and location.

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