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Analysis of Persian Gardens Using Kaplan's Landscape Preference Theory

(Case study: Fin Garden and shazdeh Mahan Garden)

Abstract: A review of findings shows that Persian gardens have attracted a wide area of interests between psychologists and environment designers. The main reasons behind attraction of Persian gardens are natural content and particular landscape configuration. To study these features, overall organization examination is employed according to psychological pattern. One of the impressive psychological pattern to evaluate the natural landscape is preference matrix which developed by Stephen and Rachel Kaplan. In this study, characteristics of Persian gardens are reviewed and they are analyzed according to the Kaplan preference factors (coherence, legibility, mystery and complexity). Because of inseparable relationship of human behavior and environment, the research methodology applies psychological approach based on a descriptive – analytical method to implement this method the library documents are used. As discussion demonstrates, concepts created from the relationship between factors and Persian gardens characteristics are associated with coherence, legibility, mystery and complexity. As well, it can be observed that the quality of material and semantic make Persian gardens more attractive to viewers.

Key words: Persian garden, Kaplan theory, natural environment, environmental psychology

1. Introduction

Studies show that, people prefer natural environments compared to human built [1, 2, 3]. Nature, especially vegetation, plays a key role in people's daily life. In addition to nature as an important content of preferred environments, studies show that the arrangement of the contents in a visual landscape significantly affects people's preferences for landscapes [4, 5]. On the other hand, in experiencing natural environment, visual quality of observed landscape plays an important role and the value of this quality lays in interactions between human and natural environment.

One of the best patterns reflecting the interactions between human and the nature is Persian historical gardens. These gardens are studied because they can fulfill human being's physical and mental needs. In Persian mind, garden has a universal picture as it has changed into an internal view through centuries. As well, gardens are considered as a part of Persian culture. In other words, Persian gardens are considered as a symbol of nature and they are a way to refer to internal beliefs.

The environmental psychological field profoundly studies the human psychological relation with natural environments. This research area is based on numerous experimental studies and less speculative than the just-mentioned modularity thesis. One of the main topics of environmental psychology is the study of different emotional states in individuals.

One of the important proposals has been developed by Stephen and Rachel Kaplan regarding the specific process based on these emotional states. The study draws a psychological pattern in priorities of natural environment. In the presented preference matrix, the occurrence of such states is significantly the result of cognitively assessing the presence of certain informational features in a setting [5]. They studied what people like in natural and built environment. Their research shows that basic informational needs influence preferences for certain landscapes. This preference framework argues that people perceive scenes or images in two and three dimensions. There are four cognitive aspects of landscape that are essential in the appreciation of a landscape namely 'Coherence', 'legibility', 'complexity' and 'mystery'. Meanwhile, there are questions with respect to the psychological environment, for which this paper tries to find answers:

-What are the connections between the Kaplan's factors in preference theory and Persian garden's characteristics?

-What would be the role of the Persian garden's elements and characteristics in psychological preference of Persian gardens?

2. Research Methodology

This research has been performed based on a descriptive – analytical method using articles, studies, reports and related documents (the library documents). Different elements and characteristics which shape the Persian garden and four factors which determine environmental preferences in Kaplan's theory are described according to previous researches. Then, in four gardens with different topographical features, these orders will be analyzed and evaluated.

3. Persian gardens

Throughout the Islamic centuries, the Persian gardens have represented images of paradise for the Persians. The gardens were built essentially to create a space for relaxation and leisure. The word paradise comes from pardis (Paridaiza) meaning garden (walled around garden) in Persian [6].

In fact, the plateau of Iran has always been relatively arid and treeless which gave the gardens such a supreme value. Compared to the open and barren wilderness, the garden is enclosed, fertile, and rich in fruit and flowers; in comparison with the drought and heat and unavoidable sun outside, it has water, coolness and shade; compared to the hostile vastness of near- desert, it has arrangement and tranquility, and is a place where one may sit in the shade, rather than walk in the fierce light of the sun. Habitants of plateau of Iran depicted aspects of their life and beliefs upon the earliest decorated pottery. For instance, some bowls show pools of water, overhung by the tree of life. Others show the world as if it is divided into four quarters, and some of these patterns have a pool at the center. This type of cross plan, in which one axis may be longer than the other, was to become the standard plan of the Persian garden under the name chahar bagh, or four gardens [7].

Since water is the main element in the Persian Gardens, the water effects geometry and axis creation, which are the channels network leading to garden geometry formation. The geometry is created by water supplying system and the needs are caused by logic of water matching well with water supplying networks. There are clear relationships between the geometry, layout of gardens and water supplying networks. There is a classification into four parts for the needs of a water supplying network that shows the geometry of gardens is based on the layout of gardens. It is observable in all

the farms and gardens created by irrigating base [8].

As well as having a role in formation of architecture, geometric is considered the base for the shape of Iranian Gardens. The most important feature and indicator of Iranian Garden is its complete geometry and ordered and pre-planned space. This geometrical base has a role in drawing out the concepts, basics and building the material of the garden. As well, it affects the way of composition of these elements which finally determine general shape of the garden. On the other hand, other orders can be recognized which have effect in shaping the garden [9].

Vegetation (trees and flowers) is another principle element in Persian gardens. The first stage in planting a tree is to determine its distance from all sides. Hence, squares are shaped and it is possible to see the row of trees from all sides. Another important principle in Iranian Garden design is an open rectangular shape landscape in front of the garden. The front side of the building has an open and long space in main landscape site. To avoid making a barrier on the front side of the garden, short plants are planted [9].

Buildings are constructed in different parts of the garden. For example, sometimes the main building is in the middle of the garden with an open view and secondary building and portal are located around it. Sometimes the main building is in one side and other buildings are around it with two crossing ways. The main landscape is located at longitudinal axis of the garden. In some gardens palace is in longitudinal axis of the main space with one third ratio and internal buildings are positioned in solitude part of the garden and the main landscape is in the opposite direction of internal buildings. Other buildings include summer, winter, water storage, bathroom and other required buildings are constructed in suitable places regarding their function. Totally, two criteria are important in Iranian Garden geometry: tree expanding beside each other and dividing the garden into squares. As well as rectangular and square shapes, there are octagonal, palace and solitaire shapes like pool in garden. Around the secondary streets which cut each other in an orderly and square shape, white-berry is planted. This plant is beautiful and remains short by regular pruning. As well, it does not occupy any space in the middle of the street. Willows are usually planted in watery areas but not beside pools because they damage the structure of the pool. Pussy is a decorative tree and its flowers are used to make distil [9].

In general, the study shows the characteristics of Persian gardens as follow: Geometry and Proportions in plan (chaharbagh), Symmetry, Centralization (main pool, main building), Rhythm (in rows of trees and in rows of fountain), Hierarchy, Being enclosed, Existence of longitudinal axis in plan (longitudinal paths and longitudinal pool), Diversity of trees and flowers.

These orders include a collection of norms, ideological bases and living customs of people which shape the methods of giving orders to the spaces. Some of these orders affect on shaping the garden as well as determining the whole shape of habitats and human environments such as land ownership, economical and living and social orders. Some of them are mainly dedicated to architecturally shaping spaces and something which is of more importance to us, i.e. the garden [9].

Persian garden is a place surrounded by mystery and restricted by codes and secrets. It is a place of memory and fantasy which does not remain within its boundaries. Its scope expands beyond its walls and limitations, including the natural and cultural basis and the potentials of the environment around it. It means more than its tangible and objective characteristics and also associates and recalls its relations with universal order. Garden enjoys the aesthetic, high transcendent and utility values all at the same time [10]. In general, considering the topography features, Persian gardens can be classified as follow:

• Garden is located on flat levels: Fin Garden in Kashan- Dolatabad garden in Yazd

• Garden is located on steep levels: Shazdeh Mahan Garden in Kerman, Takht Garden in Shiraz

• Aquatic Garden: El Goli Garden in Tabriz

• House Garden: Eram Garden in Shiraz

• Garden is located aside a river: Ayine Palace or Saadat Abad Garden in Isfahan [11]. This palace was destroyed by the order of a Qajar king.

Because of the size analysis and the capacity of the article, analysis of Fin Garden and shazdeh Mahan Garden are included in the text and the conclusion of the analysis of four above gardens are given in final.

4. Kaplan's landscape preference theory

The Kaplan's landscape preference theory proposes coherence, legibility, mystery and complexity as being the four factors that determine environmental preferences. Of these four informational factors,

coherence and complexity are based on the two-dimensional plane. They involve the direct perception of the elements in the scene in terms of their number, grouping and placement. Legibility and mystery, by contrast, require the inference of third dimension (Table 1). When viewing scenes, people not only infer a third dimension, but also imagine themselves in the scene. These two factors involve the inference of what being in the pictured space would entail [4].

Table 1: Kaplan's preference matrix [4]

	UNDERSTANDING	EXPLORATION
2-D	Coherence	Complexity
3-D	Legibility	Mystery

As the table further indicates, coherence and legibility provide information that can help to make sense of the environment. An environment that is well organized and distinctive is easier to understand. Complexity and mystery, by contrast, concern information that suggests the potential for exploration, either because of the variety of the elements or because of the cues that imply there may be more to be seen. Although in the context of a scene or environment the four informational factors operate jointly, for purposes of explanation, it is useful to consider them one at a time [4].

Understanding is enhanced in environments that are coherent and legible, while they provide information that can help people to make sense of the environment. Exploration is favored by landscapes that are complex and mysterious because of the variety of the elements or because of the cues that imply there may be more to be seen [4].

4.1. Coherence

Coherence as recently mentioned is defined; 'The structure, inherent order or patterning of that information, as perceived in a 2-dimensional array. It includes factors that make the picture plane easier to organize, to comprehend, to structure [12]. This informational factor has received relatively little study. In our perspective, coherence helps to provide a sense of order and directing attention. A coherent scene is ordered and hangs together. Coherence is enhanced by anything that helps the organization of patterns of the brightness, size, and texture in the scene into a few major units. Features as repeated elements and uniformity of texture are examples of redundancy. They help to delineate a region or area of picture plane. Properties of a scene such as texture, size and location of the various uniform areas are assumed to be the province of the 'location system', an ancient neural

structure that processes visual information with great speed and little need for inference [5].

This principle of grouping is reinforced by repetition, similarity, proximity, common enclosure, symmetry and orientation of the parts. In this area, Gestalt psychologists have also paid attention to how sensory intakes are organized, or how a whole is formed and pulled together out of the parts. Gestalt psychologists believe that if various stimulants are designed so that they are perceived as a whole unit, tension will decrease. It implies that the design is coherent. The greater the complexity of a scene, the more structure is required to organize it to be coherent [13].

4.1.1. Repetition and Similarity: The eyes tend to group things of the same type together. Even when the elements taken in pairs are somewhat different, we find that the structural resemblance dominates these differences. Repetition in the form of rhythm, as in music and architecture, is an extremely simple principle of composition which tends to give a sense of coherence. Unity of materials and texture is another example of partial characteristics which reinforce the tendency towards coherence in spite of the individuality of each building. Common scale, despite the comparative size of elements, is an effective factor in grouping by similarity. It must be emphasized that this would not be sufficient if it were the only common characteristic. When the objects differ in other ways, such as materials, texture, openings or roofs, the unity is destroyed in spite of the similarity of scale [14].

Rhythm is the repetition of an element in a regular sequence. It directs the eye and helps it to move about a space. Rhythm is essentially a disciplined movement and can be either passive or dynamic. There are essentially four types of rhythm:

• **Regular rhythm**: Rhythm created by repetition is the most common and can be seen everywhere, particularly on fabrics, plates, wallpaper, and in nature. It can involve color, line, texture, pattern, or form. Repetitive rhythm is achieved by repeating a color or pattern on a wall, on curtains or even in a painting. This type of rhythm is passive and must be handled sensitively, otherwise it becomes boring.

• **Progressive rhythm:** It is an ordered, gradual change in the size, direction, or color of an object or space. It is more subtle, dynamic, and inventive than simple repetition and can be achieved by succession in size from large to small (or vice versa) or in color by succession from dark to light (and vice versa).

• **Alternation rhythm**: rhythm by alternation or rhythm by line is the regular, undulating, and continuous flow of line or space.

• **Radiation rhythm**: Rhythm by radiation is created when object lines or motifs extend outwards from central axis, in a light fixture [15].

Texture: Texture is the relative smoothness or roughness of a surface as it appears to the eye and to touch. Texture is a unique characteristic of a material or a pattern. The appearance of texture is a direct result of the reflection of light of the materials.

• **Smooth surfaces** appear shiny and have a high degree of reflectivity and potential for glare. They also can be slippery and hasten the movement of elements such as water and debris across the surface.

• **Rougher surfaces** recede in the landscapes, absorbing light, increasing surface resistance, and slowing movement of elements across the surface [16].

4.1.2. Proximity: The eye tends to group elements which are close together and to distinguish them from those which are further apart. This grouping principle is very powerful. It makes it possible to join together that which is different using small gaps to create an articulation between elements. There is no established size for these gaps, because the cohesion depends on the relative size of the elements and on the context. When the distance is greater than the size of the smallest element, one often reports to other means (similarity, orientation, etc.), to reinforce coherence.

4.1.3. Common enclosure and common group: An enclosure, a ground, even a carpet, defines a field. What is included within the field is distinguished from what is outside it, even if the elements within are heterogeneous. This is a very effective method of unification which is frequently used. Moreover, the elements which define the enclosure form a separate subgroup.

4.1.4. Orientation of elements, parallelism or convergence towards a void or a solid:

The eye also tends to group elements which have the same position: vertical, horizontal, parallel elements …

Symmetry is a particular example of this principle. It can even contribute to the unification of such fundamentally different elements such as building and nature. These acquire a common belonging by their relation to an axis which may be either real or virtual. Trees set along a common axis with a

building, detach themselves from the surrounding nature and become part of the building complex.

4.1.5. Interaction of factors: In most organizations several factors come into play simultaneously. Reality is complex and pure situations are rare. Sometimes one factor dominates the others [14].

The quality of rhythm, a clear expression of fundamental rules of design and thematic consistency in the plan imply the quality of coherence in a plan [17, 18].

As well, the concepts of readability, organizing, predictability, signs, directions signs, and space differentiations are all associated with the concept of coherence in a plan [19]. Table 2 shows the relationships between the elements used in Persian garden's design and coherence.

Table 2: The relationships between coherence and characteristics of Persian gardens [Authors]

Characteristics of Persian gardens		Coherence (principle of grouping)									
		Repetition and Similarity						Proximity	Common enclosure and common group	Orientation of elements, parallelism or convergence towards a void or a solid	Interaction of factors
		Rhythm				Uniformity of texture					
		Regular rhythm	Progressive rhythm	Alternation rhythm	Radiation rhythm	Smooth surfaces	Rougher surfaces				
geometry	Geometry in plan	*									*
	Proportions in plan	*									
	Symmetry									*	
Centralization	Main pool					*				*	
	Main building						*				
rhythm	Rows of trees	*				*		*	*	*	
	Rows of fountain	*									
Hierarchy			*								
Being enclosed									*		*
Existence of longitudinal axis in plan	Longitudinal paths						*			*	
	Longitudinal pool					*				*	
Diversity of trees and flowers						*			*		*

4.2. Legibility

As Kaplans define it, a legible space is one that is easy to understand and to remember. It is a well-structured space with distinctive elements, so that it is easy to find one's way within the scene and to find one's way back to the starting point. It is also important that the objects be identifiable and the scene be experienced as interpretable. Legibility thus entails a promise or prediction of the capacity both to comprehend and to function effectively [5].

Legibility is one of the most important concepts associated with coherence. Legibility is enhanced by distinctive elements such as landmarks, smooth textures and the ease of compartment the scene into parts. While coherence focuses on the conditions for perceiving the scene, legibility is concerned with

movement within it. Legibility and ease of understanding the composition of environments are the main variables of coherence. Vividness and simplicity of the form, so that the form is as close as possible to geometric forms, reinforce the legibility of the form [17, 20]. Also, appropriate signs are of the most crucial factors in improving the legibility [21]. When a plan is legible, it has been organized well and enough attention has been paid to the orientation of the components. Furthermore, it is possible to link components in an interconnected format. In such condition, it is valid to claim that quality of coherence enables people to judge the identity, sense and setting of the objects, as well as the interiors of the building [17, 18]. Legibility also can be enhanced by integrating signalizations and distinctive markings, by offering views on the outside and making the shape of the building more regular [19].

4.2.1. Geometry: As Robin Evans illustrates in his essential book, namely, the Projective Cast [22]. The meaning of geometry in architecture has changed markedly over time. Evans identifies three types of geometry that have been implicit in the architecture at different times: metrical, projective and symbolic. Each of these reflects the conception of space prevalent at the time. Architectural design expresses this conception and is conditioned by it.

• **Metrical geometry** is concerned with the absolute measure of objects and therefore operates in a static, universal Euclidean space. Euclidean geometry allows the transposition of spatial ideas into visible and measurable form. It establishes a clear relationship between architectural drawings and construction, avoiding the necessity of specifying the location of each point individually. Euclidean theorems can be seen everywhere, ensuring the construction of equal angles, parallel lines, equal lengths and definite proportions.

• **Projective geometry:** addresses the appearance of objects which depends on the position from which they are seen. Its central operation is transformation, specially the transformation of one view of an object into another [23].

• **Symbolic geometry:** Our world is expressed in terms of defined dimensions. Therefore, as single and heavenly truths come into the world, they change into dimensions and geometry forms. For example, Circle represents perfection and it is divine. So in illustrating the symbolic heaven and earth orientation, the sky is always non-finite expressed by the circle. Also, the earth which is surrounded

and protected with sky is drawn by square. According to the Pythagorean, squares represent the unity of species and the equivalence of one thing to itself. Then, it can be considered a symbol of justice and law into one's eye.

4.2.2. Proportion in geometry: is a harmonious relationship between the elements and between each component and the entire system.

On the other hand, studies show important critical factors in the 'legibility' of public space; the biggest open spaces should be related to the most important public facilities. Actually, people are able to form clear and accurate image of a legible layout.

4.2.3. Lynch's theory: Lynch, who was pioneered in the topic of image maps (1960s), suggests that there are overlapping features among images that people perceive from a place, namely **paths, edges, districts, nodes and landmarks**. It would be wrong to assume that every area should contain all these features [17].

4.2.3.1. Paths: Lynch describes paths as channels for potential movement, 'Paths are the channels along which the observer customarily, occasionally, or potentially moves. They may be streets, sidewalks, transit lines, channels and railroads'. For many people, these are the predominant elements in their image.

4.2.3.2. Edge: The definition of an 'Edge' according to Lynch is linear elements not considered as paths by the observer. They are boundaries between two phases or linear breaks in continuity of shores, railroad cuts, edges of development and walls. They are lateral references rather than coordinate axis. Such edges may be barriers which are more or less penetrable and separate one region from another. They may be seam as lines along which two regions are related and joined together.

4.2.3.3. Districts: like nodes, lack the overt identification with the axial map. Axial maps inherently do not provide any sense of a hierarchical structure in their mapping of the cities or buildings. The use of developing hierarchical structures in residential plans as a means to characterize their genotypes has been discussed in space syntax literature, but the issue has been significantly little discussed with respect to urban structure. No techniques exist at the moment for capturing the natural emergence of distinct districts within a city, a phenomenon that Lynch [17]. points out as being both ubiquitous and

highly relevant to the image of the city [24].

4.2.3.4. Nodes: The presence of nodes is more puzzling than that of paths. There seems to be no reasonable method to account for where they occur, particularly with respect to the axial map. Lynch distinguishes two types of nodes. One at major intersections and those that are characterized by concentration with a thematic activity. Lynch's distinction between the two types of nodes is actually not so informative. It does not help understanding the characteristic features of nodes. On the one hand, nodes are key points used in way finding tasks, or points at which crucial route choices are offered to the subject. This type of node does not need to have any distinctive physical or visual characteristic. Obviously, such a node would be able to be identified through axial analysis. Oddly, very few of the nodes that appear on Lynch's maps seem to lie on the intersections or even in the vicinity of strong axial lines [24].

4.2.3.5. Landmarks: Landmarks, the point references considered to be external to the observer, are simple physical elements which may vary widely in scale. Since the use of landmarks involves the singling out of one element from a host of possibilities, the key physical characteristic of this class is singularity, some aspect that is unique or memorable in the context [17]. Landmarks and regions (concepts for which lynch provided perceptive analysis) that are distinctive and meaningful are important aids in achieving legibility. These help in building a cognitive map in the memorability of a scene [5].

Studies show architecture's role in facilitating way findings by creating legible spaces (spaces are classified and defined spatial units), creating a key destination, creating an opportunity for members to review the whole space, decreasing the complexity in the overall arrangement and composition of spaces, emphasizing the use of architectural components to routing purposes, attention to the geometry of the space, applying the symptoms of stress and isolation zones and creating legible circulation system [25]. Table 3 shows the relationships between the elements used in Persian garden's design and legibility.

Table 3: The relationships between Legibility and characteristics of Persian gardens [Authors]

	legibility

Characteristics of Persian gardens		Vividness and simplicity of the form				Important critical factors in the "legibility" of public space (Lynch's studies)					factors in facilitate way findings						
		Geometry			Proportion in geometry	Paths	Nodes	Districts	Edge	Landmarks	Legible spaces(spaces are classified and defined spatial units)	a key destination	review the whole space	the lack of complexity in the overall arrangement and composition of spaces	emphasizing the use of architectural components to routing purposes	applying the symptoms of stress and isolation zones	Legible circulation system
		metrical	projective	symbolic													
Geometry	Geometry in plan	*	*	*				*			*		*		*		*
	Proportions in plan				*						*						
	Symmetry	*						*						*			
Centralization	Main pool						*			*		*		*	*	*	
	Main building						*	*		*		*		*	*	*	
Rhythm	Rows of trees								*					*			
	Rows of fountain								*					*			
Hierarchy																	*
Being enclosed									*								
Existence of longitudinal axis in plan	longitudinal paths					*								*			*
	longitudinal pool					*											
Diversity of trees and flowers								*									

4.3. Mystery

Mystery means the amount of hidden information within the environment that one can discover [26]. Thus, there must be a promise of further information if one could walk deeper into the scene. This necessarily implies that it would be possible to enter the scene, that there would be somewhere to go [5]. There are several ways for scenes or settings to suggest that there is more information available. Some classic examples include the bend in the path and a brightly lit area that is partially obscured by foreground vegetation. Partial obstruction, often from foliage and even modest land-form changes can enhance this sense of mystery [5]. Some claim that this property can also be conveyed by specific design elements: 'when appearing around corners attached to walls and hung from ceilings, interesting objects, architectural details or motifs, graphics, video displays and artifacts can create a little mystery and surprise in the workplace' [27].

However, the most straightforward way to apply mystery to an architectural setting is '**deflected data**'. This can be realized by letting the architectural trail (e. g. corridor) to bend away, which can lead to curiosity of what might lie beyond the bend that result in encouraging explorative behavior. Another

mode of mystery is called '**enticement**'. Essentially, this notion refers to the situation in which a person is in the darks, where it can see a partially visible and enlightened area or setting. Such enlightened regions draw attention and trigger explorative behavior. Although mysterious settings can be aesthetically appealing, too much irregularity or surprise can lead to confusing and nontransparent building layout. This ultimately results in orientation and way-finding problems [28].

The suggestion that there is more to see is very compelling. There are various ways for a landscape to provide hints of what is coming: A curved path is often more enticing than a straight one. Vegetation that partially obscures what lies behind can invite the visitor to take a look. Blocked views, however, certainly lack any scene of mystery. One is less likely to be intrigued when can not see anything behind a jumble of vegetation. The various studies of people's preferences for different environments show that mystery is a particularly effective factor in making a scene highly favored [4].

Mysterious scenes are characterized by continuity. There is a connection between what is seen and what is anticipated. While there is indeed the suggestion of new information, the character of that new information is implied by the information that is available. Not only is the degree of novelty limited in this way, there is also a sense of control, the sense that the rate of exposure to novelty is at the discretion of the viewer. In a highly mysterious scene one could learn more if one were to proceed further into the scene. Thus, one's rate and direction of travel limit the rate at which new information must be dealt with [13].Another mode of mystery in architectural setting is mystery in the **'concept'** of architecture design, which helps the spaces to be more attractive. Table 4 shows the relationships between the elements used in Persian garden's design and mystery.

Table 4: The relationships between Mystery and characteristics of Persian gardens [Authors]

Characteristics of Persian gardens		**Mystery**		
		Deflected data	**Enticement**	**Concept**
Geometry	**Geometry in plan**			*
	Proportions in plan			*
	Symmetry			
Centralization	**Main pool**			
	Main building			
Rhythm	**Rows of trees**			
	Rows of fountain			
Hierarchy		*	*	
Being enclosed			*	
Existence of longitudinal axis in plan	**Longitudinal paths**			
	Longitudinal pool			
Diversity of trees and flowers		*		

4.4. Complexity

Complexity is defined in terms of the number of different visual elements in a scene. It is concerned with scene interaction and richness. It thus reflects how much is going on in a particular scene, how much there is to look at- issues that call upon the picture plane, as opposed to depth cues. Clearly, exploration is enhanced when there is more variety in the scene. As a matter of fact, there are more different things available. It could be argued that complexity provides content or things to think about [5]. Complexity is the involvement component a scene's capacity to keep an individual busy without being bored or overstimulated. Often referred to as diversity, variety or richness, it used to be regarded as the single most important factor. Kaplan describes it as how much is 'going on' in the scene-a single field of corn stretching to the horizon will not have the same level of complex it has many fields of many crops on undulating land with hedgerows and cottages. The more complex scene will tend to be preferred to be simpler. Complexity and novelty of space bring about the stimulation as well. Research shows that people require such extent of complexity and novelty that provides them with challenging opportunities. Extreme complexity or novelty of space makes the interior confusing and impossible to analyze. However, a low level of complexity creates a sense of worthlessness and typicality [18]. The low-coherence scene could be used as an example of high complexity. One can readily tell that there is a richness of elements in the setting. It appears intricate and has many different visual components to consider. By contrast, large and open expanses are low in complexity [4]. Most people understand complexity as a disorganized variety. In fact, there are two distinct types of complexity: '**organized**' versus '**disorganized**'. Biological forms are highly complex, and at the same time marvelously organized, thus establishing the relationship between life and organized complexity [29]. Table 5 shows the relationships between the elements used in Persian garden's design and complexity.

Table 5: The relationships between Complexity and characteristics of Persian gardens [Authors]

Characteristics of Persian gardens		**Complexity**	
		Organized	**Disorganized**
Geometry	**Geometry in plan**	*	
	Proportions in plan	*	
	Symmetry		
Centralization	**Main pool**		
	Main building	*	
rhythm	**Rows of trees**		
	Rows of fountain		

Hierarchy			
Being enclosed			
Existence of longitudinal axis in plan	**Longitudinal paths**		
	Longitudinal pool		
Diversity of trees and flowers			*

5. Case study

5.1. Garden located on flat levels: Fin Garden in Kashan: Designed for Shah Abbas I, this garden is renowned as being the very precis of the Persian garden. There are four different gardens inside the garden which are separated by principal and secondary axis. These axis are made as channels with turquoise tiles [30]. The garden is organized as a chaharbagh with a pavilion at the intersection of the principal axis. This pavilion faces the main house in one direction and in the other a smaller pavilion with a talar porch. It faces a large pool on its south side. The pavilion overlooks a broad channel that runs to various subsidiary buildings along the north wall which is slightly elevated. Accentuated by the luminous blue faience tile lining the channels, water can be found everywhere in the garden. It defines the principal axis of the plan, encircles the garden and runs through the central pavilion. It runs down small cascades (chadars) and jets upward in fountains. A secondary water axis runs along the south-west side leading to another nineteenth-century pavilion and basin (called the HowzJushan) that marks the water's point of entry into the garden. The waterworks and dense shady plantings of fruit, willow, and ancient cypress trees are a dramatic contrast to the desert setting of the Bagh- I Fin estate [31]. Bathhouse (hammam) is located on one side of the garden that is well-known as the place where Iranian nationalist hero, Amir Kabir, was murdered. On the opposite side of the garden Kashani National Museum is placed. Textiles, ceramics and calligraphy are exhibited in the museum.

Figure 1: Analysis of Coherence in Fin garden [Authors]

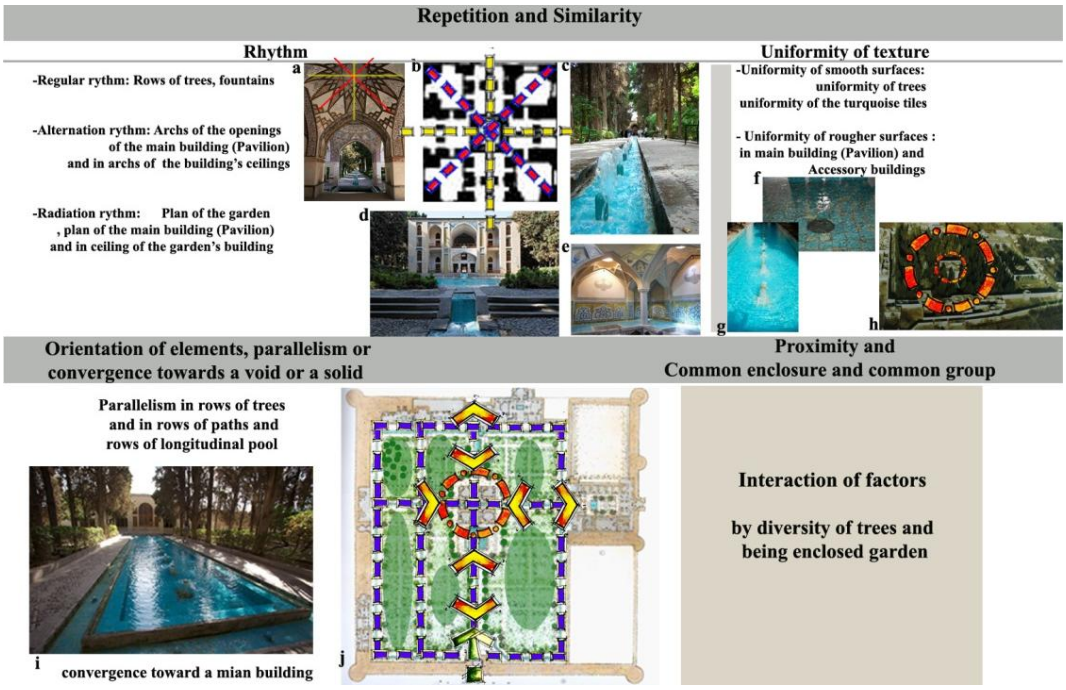


Figure 2: Analysis of Legibility in Fin garden [Authors]

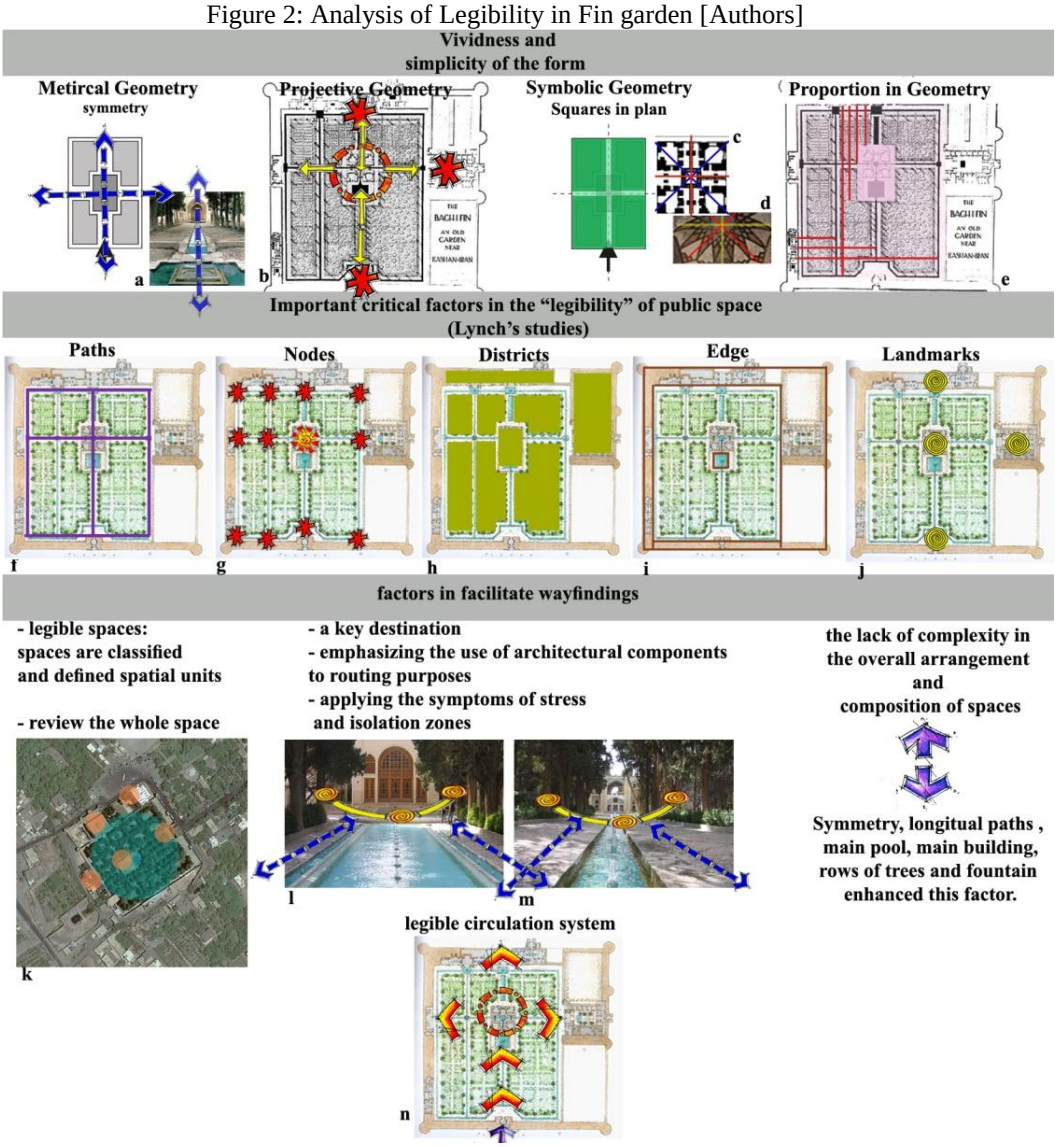


Figure 3: Analysis of Mystery in Fin garden [Authors]

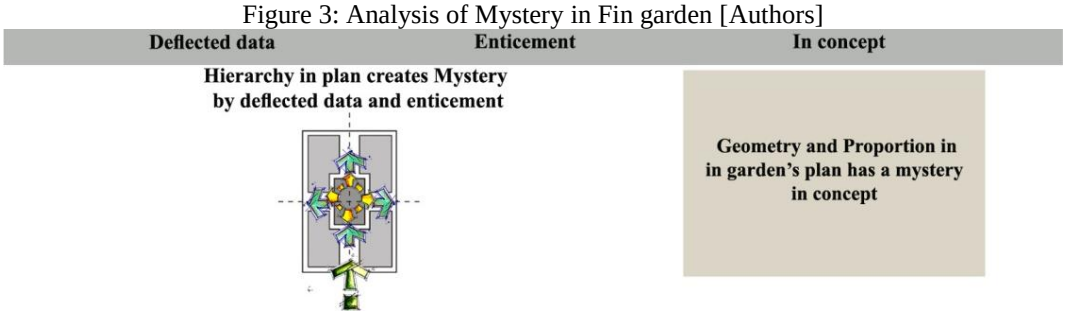
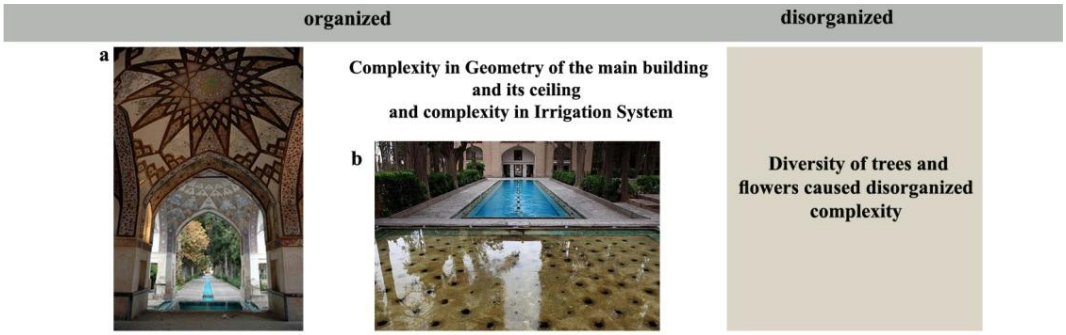


Figure 4: Analysis of Complexity in Fin garden [Authors]



5.2. Garden located on steep levels: Shazadeh Mahan Garden in Kerman

Shahzadeh Garden is located in 35 km from the south-east of Kerman, and at 6 km from Mahan, on the Kerman-Bam Road near the altitudes of Joupar. It is an Iranian garden benefiting from the best natural situation. Shahzadeh Mahan Garden is constructed in Qajar Era, at sover eignty of Abdolhamic Mirza Naseroldoleh. This garden is located near the tomb of Shah Nematollah Vali on the hill sides of Joupar altitudes. This garden is constructed on an arid and barren land because of its fertile soil, sufficient sunshine, mildwind, and access to Tigaran water. Owing to the 6.4% slope along the garden, a height difference of about 20 meters occurs in the 407 meters length. This natural slope has led to divisions in the garden defining the nature of the garden. In the garden, along the main axis landscapes of Joupar altitudes are seen. This long landscape is hidden by the huge size of the main structure and is reinforced by the trees at both sides having different colors at different seasons. The water's streams along the garden's main axis and the waterfalls with nice sounds have contributed to a high quality for this axis. Tree reflections, the facade structure and the gazebo have contributed to a pleasant feeling, peace and solitude in the garden. Light and shade play a significant role in this landscaping [32].

Figure 5: Analysis of Coherence in Shazdeh Mahan garden [Authors]

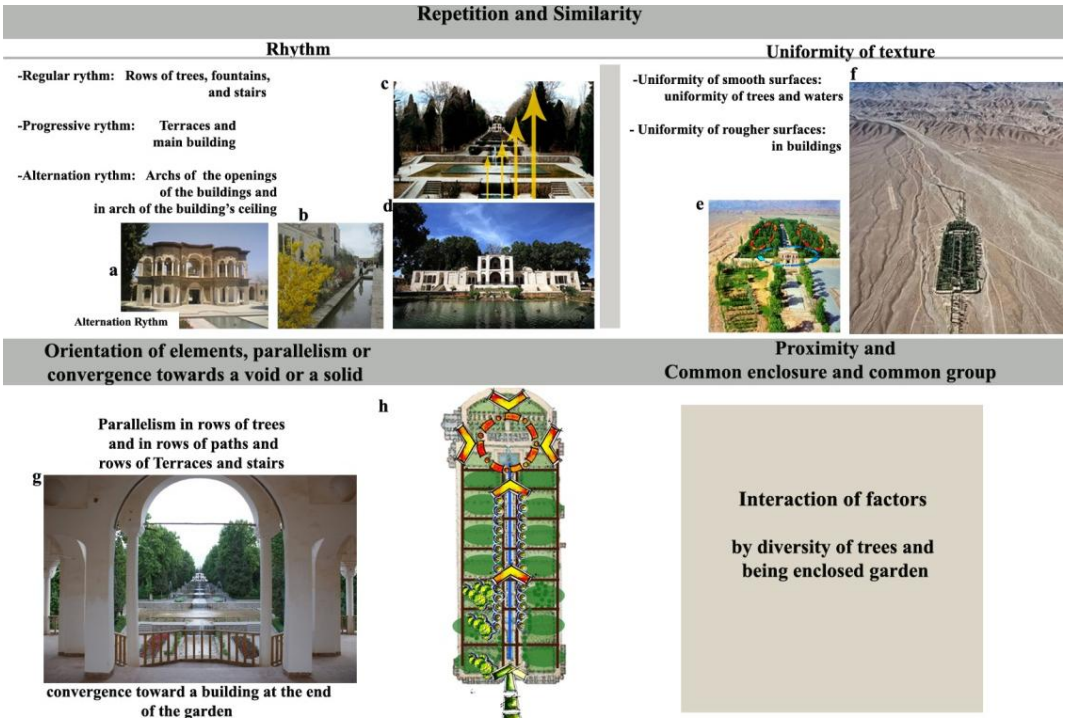


Figure 6: Analysis of Legibility in Shazdeh Mahan garden [Authors]

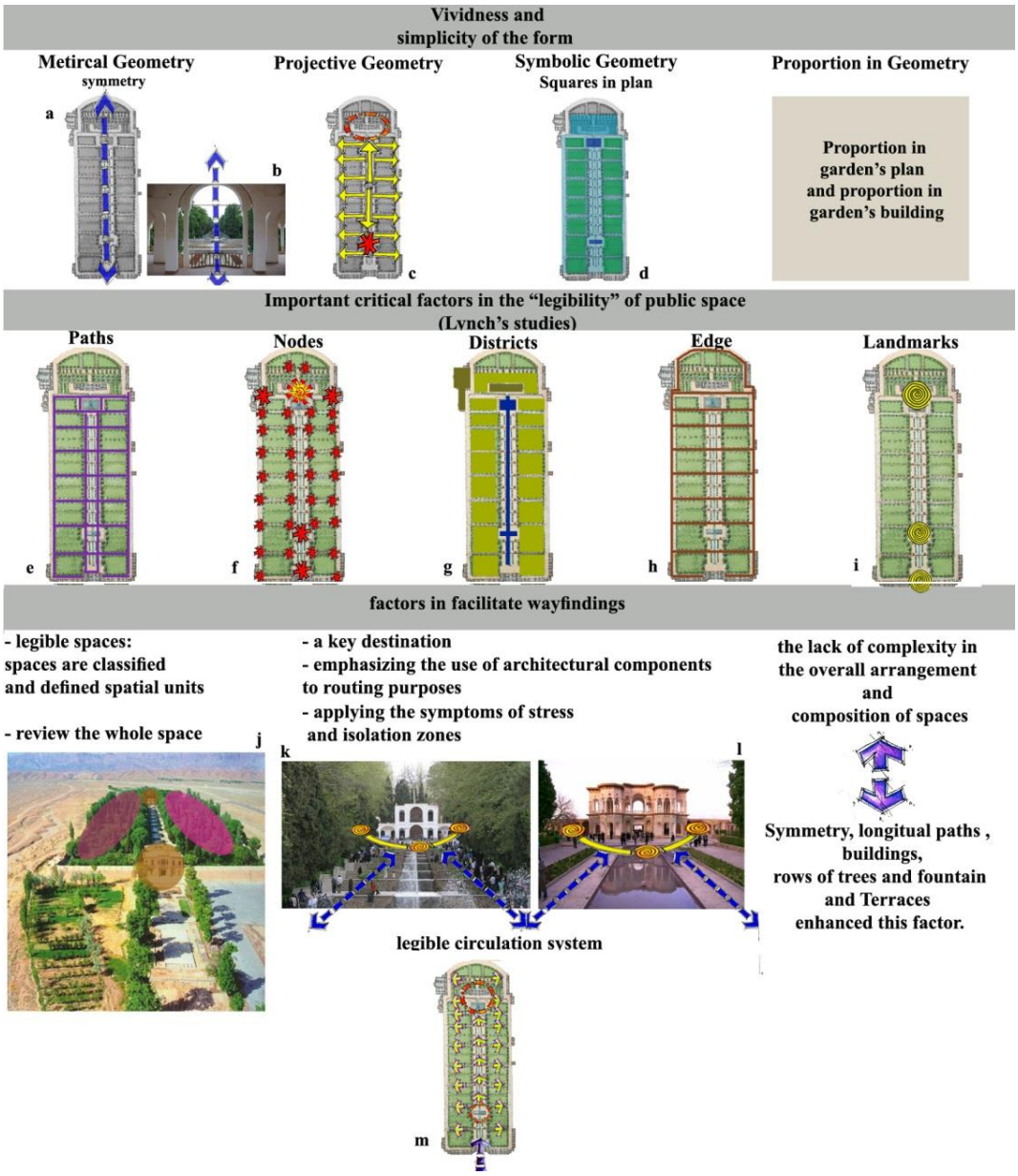


Figure 7: Analysis of Mystery in Shazdeh Mahan garden [Authors]

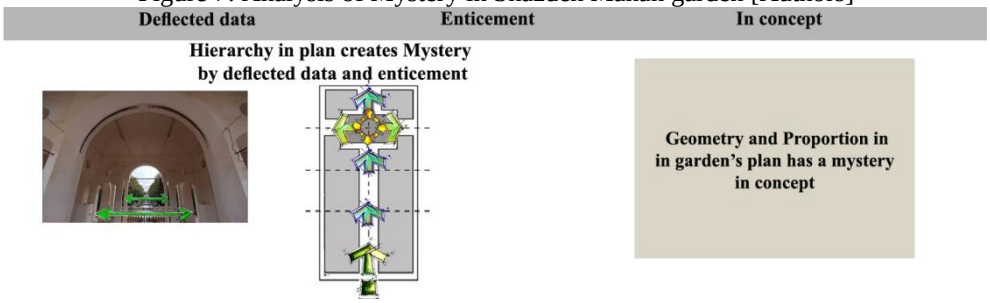
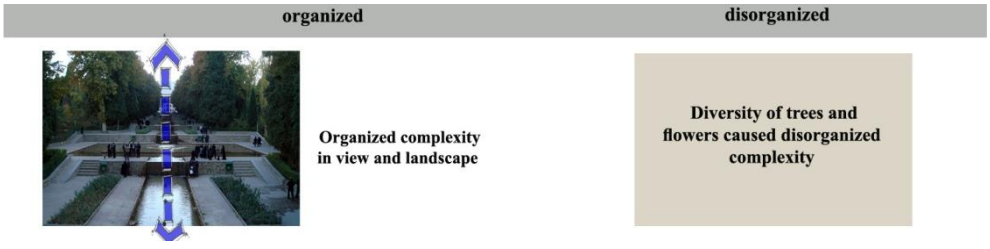


Figure 8: Analysis of Complexity in Shazdeh Mahan garden [Authors]



6. RESULTS AND DISCUSSION

The extracted results of studies indicate that studying the overall organization of the gardens is an effective method to understand the superiority of Persian gardens landscape to separate physical elements. The overall organization makes a relation between the physical characteristics of the raw garden and aesthetic responses of a viewer. As mentioned above, this paper applies an effective psychological pattern in preference of natural landscapes based on framework provided by Stephen and Rachel Kaplan, Obtained results are according to Kaplan's preference theory based researches to determine the reaction of a person to the environments including four factors: Coherence, Legibility, Mystery and Complexity. Results of this discussion are given in Table 6. As can be observed, in the analyzed gardens, factors of Coherence, Legibility, Mystery and Complexity can be considered in different parts of the gardens from different aspects.

Table 6: Case studies analysis, the relationships between garden's elements and Kaplan's preference factors [Authors]

Kaplans Preference Factors				Fin Garden	Shazadeh Mahan Garden	Eram Garden	El Goli Garden
Coherence (principle of grouping)	Repetition and Similarity	Rhythm	Regular rhythm	+	+	+	+
			Progressive rhythm	-	+	+	+
			Alternation rhythm	+	+	+	+
			Radiation rhythm	+	_	-	+
		Uniformity of Texture	Smooth surfaces	+	+	+	+
			Rougher surfaces	+	+	+	+
	Proximity			+	+	+	+
	Common enclosure and common group			+	+	+	+
	Orientation of elements, parallelism or convergence towards a void or a solid			+	+	+	+
	Interaction of factors			+	+	+	+
legibility	Vividness and simplicity of the form	Geometry	metrical	+	+	+	+
			projective	+	+	+	+
			symbolic	+	+	+	+
		Proportion in geometry		+	+	+	+
	Important critical factors in the "legibility" of public space (Lynch's studies)	Paths		+	+	+	+
		Nodes		+	+	+	+
		Districts		+	+	+	+
		Edge		+	+	+	+
		Landmarks		+	+	+	+
	factors in facilitate way findings	legible spaces(spaces are classified and defined spatial units)		+	+	+	+
		a key destination		+	+	+	+
		review the whole space		+	+	+	+
		the lack of complexity in the overall arrangement and composition of spaces		+	+	+	+
		emphasizing the use of architectural components to routing purposes		+	+	+	+

		applying the symptoms of stress and isolation zones	+	+	+	+
		Legible circulation system	+	+	+	+
Mystery	deflected vista		+	+	+	+
	enticement		+	+	+	+
	concept		+	+	+	+
Complexity	organized		+	+	+	+
	disorganized		+	+	+	+

7. CONCLUSION

In the context of this study, the characteristics of the Persian garden and the role of its elements in preferring the landscape have been shown. Also, studies shows that elements shaping the gardens have close relationship with Coherence, Legibility, Mystery and Complexity which are important factors in perception of the natural environment. Based on above analysis, these elements in Persian Gardens are used to provide the best psychological and aesthetic responses for viewers. Features utilized for designing these Gardens are in a close association with four factors mentioned above. Table 7 shows the relationships between the elements used in Persian garden's design and the four factors developed by Kaplans.

Table 7: the relationships between Persian garden's elements and the Kaplan's preference factors [Authors]

Kaplans Preference Factors				Persian garden's elements
Coherence (principle of grouping)	Repetition and Similarity	Rhythm	Regular rhythm	rows of trees, fountain & rows stairs and terraces in Gardens located on steep levels
			Progressive rhythm	terraces in Gardens located on steep levels& in the main building of some gardens
			Alternation rhythm	Arch of the openings of the main building & Arch of the building's ceilings & In the longitudinal pool of some gardens
			Radiation rhythm	Plan of some gardens & Main building with central plan and in Ceiling of them
		Uniformity of Texture	Smooth surfaces	Uniformity of the trees texture and water texture & Uniformity of the turquoise tiles texture in some gardens
			Rougher surfaces	Uniformity of texture of the Main building and accessory buildings & Paths in gardens
	Proximity			Most elements of the garden which are close together and to distinguish them from others are perceived as a whole unit
	Common enclosure and common group			What is included within the garden like trees is distinguished from what is outside it & what is included within the main building or with in the main pool is distinguished from what is outside them
	Orientation of elements, parallelism or convergence towards a void or a solid			Parallelism in rows of the trees, rows of the paths, rows of the longitudinal pool & Parallelism in rows of the terraces and stairs in some Gardens located on steep levels Convergence toward a main building or main pool
	Interaction of factors			By diversity of elements such as different vegetation and different buildings which located in enclosed garden
legibility	Vividness and simplicity of the form	Geometry	Metrical	Symmetry, equal angles, parallel lines, equal lengths and definite proportions in Persian gardens
			Projective	Addresses toward the main building and main pool & Addresses toward the accessory buildings
			Symbolic	Squares in plans of the gardens & circular and central design in plan of

			the buildings in most of the gardens have a symbolic Geometry
		Proportion in geometry	**There are Proportions in all of the parts in Persian gardens, such as location of the main building & dimensions of the buildings and in geometry of the its plan & location and dimensions of the pools**
	Important critical factors in the "legibility" of public space (Lynch's studies)	**Paths**	**Longitudinal, latitudinal paths & paths on the terraces and stairs toward the main building on the highest level in Gardens located on steep levels& paths around the garden**
		Nodes	**Nodes created by Collision of two longitudinal and transverse paths & Collision of longitudinal and terraces in Gardens located on steep levels**
		Districts	**Districts created by segmentation of the gardens to four parts (chaharbagh) in most of the Persian gardens & segmentation of the gardens to planting the vegetation in each part & by building's special location in gardens in**
		Edge	**The walls around the garden & The edges of the pools & the edges of stairs and terraces in Gardens located on steep levels**
		Landmarks	**Main building (pavilion) & the pool in front of it**
	Factors in facilitate way findings (legible spaces, a key destination, review the whole space,…)		**All of the elements in designing Persian gardens facilitate wayfindings as discussed above the table**
Mystery	**Deflected data**		**Enclosed and Hierarchy in Persian gardens caused enticement and added deflected data to viewers of the garden**
	Enticement		
	Concept		**Geometry and Proportions in gardens design**
Complexity	**Organized**		**Geometry of the garden and the buildings of them & in ceiling's structure & structure of the arches in openings and ceilings**
	Disorganized		**Diversity of the vegetation such as trees, flowers,…**

According to above analysis, some conclusive statements can be made:

• First, coherence in Persian gardens is considered as an important factor based on Repetition and Similarity (by Rhythm and Uniformity of Texture), Proximity, Common enclosure and common group, Orientation of elements (parallelism or convergence towards a void or a solid) and Interaction of factors. As mentioned in Table 7, Rhythm in Persian gardens is indicated in different ways. Rows of trees and fountain, plan of garden and its buildings, uniformity of texture developed by proximity of trees in a considerable range of the gardens and proximity of rougher surfaces such as buildings and paths are important factors for determining the rhythm. To sum up, all the analysis indicates that elements in Persian gardens create a whole unit in spite of the diversity in all aspects.

• Also, legibility as an important factor in the priority of landscape exists in Persian gardens. As can be observed, metrical, projective and symbolic geometry are indicated in all elements of the garden which is an important factor to the legibility of the space. Furthermore, results of study show the Lynch's factors in legibility of space and its relationship to Persian gardens. Paths, Nodes, Districts, Edge and landmarks are seen in all of the Persian gardens. Design features such as longitudinal and latitudinal axis, segmentation of the gardens into four parts, designing the walls around the garden, locating the

building in central position and so on are used in all of the Persian gardens. Generally, all elements in Persian gardens facilitate way findings by creating legible spaces and key destination, applying the symptoms of stress and isolation zones, reviewing the whole space, decreasing complexity, emphasizing the use of architectural components to routing purposes and creating legible circulation system.

• Mystery in Persian gardens can be seen in the garden's structure in addition to its concept. Being enclosed and Hierarchy in Persian gardens cause enticement and add deflected data to viewers of the garden.

• Disorganized complexity has been established in all gardens through a wide variety of trees and plants. Organized complexity can be seen in geometry of the garden and buildings, ceiling's structure and openings' arches structure.

Finally, it can be realized that features such as geometry and proportions, symmetry, centralization, rhythm, hierarchy, being enclosed, existence of longitudinal axis in plans, trees and flowers diversity and so on are principal patterns shaping the Persian gardens. They are based on the cultural, social, economical and religious beliefs of Iranian and have a close relationship with psychological and aesthetical perception of the landscapes and environments.

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