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Investigation and Evaluation of the Ecological Architecture Components from the Perspective of Designers and Special Users in Multi-Functional Buildings Case Study: Padideh Complex of Mashhad City

Hamid HamedSardar[1], Said Tizghalam Zonouzib *[2], Shooka Khoshbakht Bahramani [3]

1. 2. 3. Department of Architecture, Central Tehran Branch, Islamic Azad University, Tehran, Iran.

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ABSTRACT

Today due to disruption in the natural order, energy consumption and global warming emerged. This research aims to extract and evaluate the components of ecosystem architecture by the combination method of nest-to-nest in multi-functional centers in Mashhad city. First, a systematic study in the extraction of ecosystem architecture variables is performed, then the qualitative questions were prepared. A semi-structured interview with 28 experts was performed. Sampling is based on Snowball. An analysis is performed by using data reduction techniques include open and axial coding. In the quantitative part, questionnaires are compiled based on the data in the previous stages and are provided to 384 special users and designers. The results show that from the perspective of spatial users, the components of ecological architecture affecting Shandiz multifunctional complex are the use of physical elements, hierarchy, and renewable energy storage. According to the view of the experts, the use of practical equipment, building location, use of local natural materials, and spatial diversity are the most effective factors. Both groups consider the use of local natural material effective than other factors and they can grow other factors by their configuration. Based on the regression results, the use of objective and visible components for space users has higher coefficients and it can have a more ecological appearance in showing this building, but the designer group refers to both objective and non-objective aspects that have been used ecologically in the design. Therefore, evaluating the physical aspects of multi-functional buildings can create more ecological architecture.

***Keywords**: Ecosystem architecture, environmental quality, multifunctional building, Mashhad city, Padideh complex.*

1. INTRODUCTION

Paying attention to ecosystem was seen initially in the architecture of every climate and even this type of vision in architecture was considered in the best way for construction up to about one century ago; but along with the growth of modern architecture in the world, attention to the environment, both culturally and climatically, was forgotten. In fact, after providing energy with low cost, what happened in thermal instruments and cooling ventilation of buildings? Easily we can assert that all of the buildings are accustomed with thermal and cooling ventilations that give the possibility to appear buildings with unacceptable glass box

*Corresponding author:
arch.szonouzi@yahoo.com

shapes with every kind of climate and in every geographical longitude without any concern in incompatibility and impropriety of this kind of architecture with the climate (1). While the ancients made good profit of natural energies to create comfort in their settlements, but with the accessibility to fossil fuels and the rise of modernity and the dominance of nature, a kind of disregard for natural energies took place. Today, the emergence of the energy crisis in the 1970s, coincided with the support of environmental energy saving management, especially solar energy, which played a special role in the works of professional designers. Also, in addition to the influence of this fact on architecture forms, new systems for covering buildings (like semi apparent coatings that make shade and light refraction) in order to balance in energy was invented. Another point is to pay attention to renewable materials, especially in the building shell, which has the ability to exchange in different periods with low costs. This is how fossil energy consumption can be reduced (1). Because with the current trend in the large section of the world's architecture, there will not be much fuel left for future generations, and in addition to environmental pollution in the conversion of gasoline to energy, it will reduce natural life by destroying untouched land. In this basis, it is necessary to have a fundamental revision in human's thinking way specially designers for commitment to the environment. For this sake, architectures should have the ability to interfere more in the using method of the compatible materials to the environment and the endless energy of sun and city planners should prevent unnecessary developments. As a result, the city, its buildings, and their various elements need to be interpreted as a general system of energy flow and materials (1). In 2020, since the coronavirus pandemic caused the closure of a large percentage of commercial, industrial sections and reduced urban and suburban transportation, less electrical and mechanical facilities were used and waste production was reduced. According to the conducted research, the average temperature in Mashhad has been reduced compared to previous years, so it is concluded that the future of life on Earth depends on the reforms that must be made in various sectors in the field of energy consumption, which in the field of architecture and construction and quality of the country into a framework and practical and operational framework is sensible. It is quite tangible. This study with the purpose to extract and refine the ecosystem components in relation to multifunctional buildings in Mashhad was performed and it tries to find the solution of this question: from the perspective of designers and spatial users, which of the components in ecological architecture in Mashhad has the greatest impact on multifunctional buildings?

2. literature review

2.1. Ecology

The word ecology is composed of two words (ECO) and (LOGY) with the meaning of habitant and cognition, in Persian the meanings of habitant and cognition is turned which was asserted by Hegl at the first time (2). The word ecology, as a term has Greek roots. In general, ecology studies the interaction and relationship between the organism and the surrounding environment. The environment includes physical characteristics that are composed of living and non-living factors. Ecology consists of many sub-disciplines, eco physiology, interactive ecology, behavioral ecology and architectural ecology (3). Ambiguity in the perception of ecology term makes an individual to recognize foreign and region. While the exact meaning, in addition to understand the environment and compatibility with nature, extracts and overlaps the physical, social and biological layers of the region (4) and watches tools that leads to the integration of the interaction between the environment and living organisms in diverse species and it leads to adapt with the environment in order to provide solutions with respect to sustainable development to reduce their harmful effects on the ecosystem (5). In the modern world, because of reduction in the quality of life and lack of connection between users and natural

environments, comprehensive crisis has surrounded all aspects of people's living. Hence, a solution according to ecologic principals is beneficial to the population and natural environment, so, the large challenge in the new century is the activity of people with the surrounding environment.

2.2. Ecologic architecture

In the ecologic architecture, environment is considered as a principal. Ecological designs should use systems that are fed naturally. Environmental design involves locating, using sunlight and using local materials (6). In new constructions in hot and cold climates, using solutions that can overcome its characteristics with low energy consumption are practical. In ecological architecture, the first step is to create a sustainable building. In the present century, ecological science has acted as a driving force, such as economics, society, philosophy, renewable energy and etc. affects certain aspects of architecture and urban planning (7). In architecture, constructing an artificial environment is performed by human that is famous as the constructed environment in the natural environment. Ecologic architecture is not only a style, but also this as a designing criterion reminds our duties to the environment and its way of maintenance is implemented by using renewable sources.

Ecological architecture is important in achieving urban and global ecology and should have the most comfort for its residents with the least impact on nature and in addition it should have high efficiency. Paying attention to the structure of each building that is in line with its bed and supporting its topography and its location to control and make optimal use of weather conditions and using the maximum amount of sunlight are very important. Flexibility in ecological architecture can create spaces having the ability to respond several kinds of functions with the smallest changes (8). The use of intelligent systems, savings, solar energy storage resources, recyclable and low-cost materials are at the forefront of ecological design criteria (9). The architecture of concepts such as efficient design of building, environmental building design, coordinate, sustainable, intelligent design are performed with the aim of producing social, economic, environmental and cultural buildings. Ecological architecture is derived from ecological designs in specific dimensions and in order to fulfil this architecture, characteristics derived from sustainability and sustainable development should be used (10).

2.3. Ecological design

Ecological knowledge is the method to integrate man-made designs in nature with environmental systems. Also, ecology in man-made environments, tries to have a key role in the development of sustainable development to lead the improvement in environmental quality. Therefore, sustainability is achieved when ecological design leads to improve the quality of the environment (11). In fact, we can assume that the ecology is a system of thinking in design based on the use of nature-friendly systems that can be optimized in humanizing environments (12). Ecological design is paying attention to the method of using the components and the correct use of components in their synchronization.

2.4. Ecological factors in natural environment:

Paying attention to the environment has been associated with human from long ago and the sensible harmony of the constructed environment and the natural environment can be derived from the past times. In fact, man's dependence on nature is related directly to his achievement of comfort and tranquility (13). Therefore, the first familiar signs for every individual is achieved from the nature with his surrounding environmental identity, in topography and mountains, rivers and etc. location, plant species, bed and natural environment (14). In addition, climate synchronization is more about historical architecture than anything else, in which the artificial regulators are minimized and consequently include economic and environmental benefits (15). Hence, considering the climate parameters as a climate-synchronized architecture has a direct effect on the health of spatial users, quality, indoor air, thermal comfort and energy consumption which includes temperature, humidity, sun and air flow (16).

2.5. Components of human-made environment

The human's environment means the construction of a human living space with a set of effective activity and behavioral systems in the environment. (13). In the human-made environment, making any experience from nature, in addition to health, provides spiritual needs and recovery of the mind; but its failure will lead to anxiety, stress, etc. (17).

In addition, reduction in non-renewable sources and developing environment is effective on human health in the environment (18). Researches, emphasize on the existence of natural materials as a section of shell of building along with direct relation with nature. In fact, the natural materials with compatibility ability, recycling and minimum usage of material and energy does not have harmful environmental effects (19). In addition to materials, recycling and solutions for the accumulation and using water in man-made environments are of great ecological importance (20). Thus, the order and complexity between nature and building users is beyond linear and uniform thinking. Thus, in recent decades, the biophilia hypothesis speaks about an instinctive connection and tension between man and nature (2). In this basis, nature must emerge to respond the needs in different ways in the main components of the human environment. Build to emerge. In addition, in ecological architecture, aesthetic features derived from the visual environment are met by applying the features of the surrounding nature in the human-made environment and its body. Also, in the past, the harmony between the human-made environment and nature by benefiting from the nature's functions in the spatial form and structure of the building and by learning the principles of cycles and recycling was performed and it was matched visually. Over time and by the evolution of human life, the visual environment distanced from the natural environment and a visual ecological crisis was created (21). In this regard, since past times the adaptation with nature can be observed in the use of nature for organizing space, form, function, materials, proportions and etc. (22). Environmental policies in ecological architecture have comprehensive dimensions with the ability to apply in all stages of the construction. Therefore, the abilities related to a specific group of people and their social and cultural structure is expected from the environment, such as physical properties of space, spatial structure, and the nature of the user's activities, configurations and cultural and social patterns that are important (13). Also, using environmental technologies, maximum economic efficiency and planning process are the principled dimension of ecology (23). From the ecologic solutions, in new buildings, we can mention the sustainable technics derived from the natural sources in traditional houses which are produced without harming nature with the local technologies.

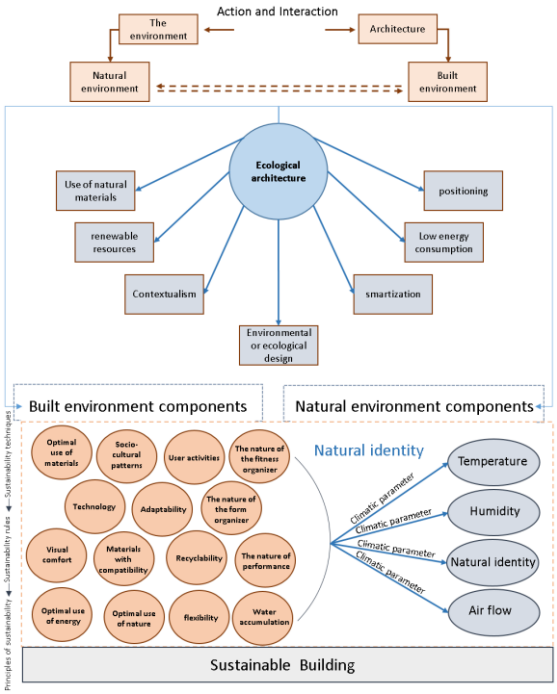


Figure 1: Ecological architecture components

3. Materials and Methods

This research is practical-developing and in terms of method is combination of inside-in-inside (quality in quantity). Due to development of components in ecologic architecture, for evaluating components it is necessary to fit the ecological architecture factors with the case study samples. First, for extracting components and evaluating them, the semi-structured interviews were used. The questions point at the ecologic architecture and ecologic design. Evaluating the questions was performed by the theoretical consensus of professors. In the quality stage, reduction in the texts of interviews was performed by using open coding with descriptive approach and live coding. To facilitate this matter, Atlasti software is used and the prominence of the extracted variables is determined. The number of interviews is done until the theoretical saturation and repetition in texts, that in this research this state is reached from the 26th interview onwards. In the next step, to determine the factor contribution of each ecological architecture variable in the multifunctional complexes, a questionnaire with a Likert type is prepared. The validity of the questionnaire was calculated with the formula CVR=0.78. Alpha Cronbach for the reliability of the questionnaire was 0.75. The

sample size for both groups was 384 people and the upper limit of Morgan table was considered. In this research, the method of distributing the questionnaire for the group of spatial users is selected as random.
Then, these questionnaires were distributed between experts for analyzing the factor contribution of ecologic architecture design variables. The criteria for entrance in research for both groups are as follow:
In the quantitative stage for determining correlation and factor contribution between ecologic architecture variables the perceived statics in JMP software were used. The result was shown in diagramed and graphical form.

Table 1. The criteria for entrance in research for both groups of participants (Source: Authors)

Criterion for entrance in the research of spatial users	Criterion for entrance in the research of designers
They should have willing to participate in the research, considering the conditions in different places.	Selected in the form of snow ball
Have academic education	Have the research field in sustainability and with environmental architecture
They should visit multifunctional buildings	Have teaching experience in university and architecture design
Be familiar with sustainability concept	Have the design experience in multifunctional complexes in large scale

3.1. Example

Padideh Shandiz multi-purpose amusing complex is the largest complex in the country in its kind. This complex includes a shopping mall with 500 thousand square meter foundation, water park, two office towers, conference halls, residential units under the title of mid-range apartment and a twin tower include a 5-star luxury hotel and a service of apartment, the towers with a height of more than 160 meters above ground level are the tallest residential building in Iran. The preparation of conceptual plans and the first phase of the project was completed by English company ATKINS and the preparation of a significant part of the executive plans of the project has been performed by ATEC consulting engineers. Preparation of landscaping and interior design of the project from the beginning of the first phase was the part of ATTAC services.
The dream city of Padideh Shandiz has been designed on a 50-hectare land with foundation of 1,110,000 square meters in the center of Shandiz city and its executive operation was started. This complex is predicted as the largest shopping mall, entertainment and leisure center and can give wide range of important, quality and memorable services to millions of visitors to Mashhad, with a population of 8200,000 citizens and pilgrims of the Holy Shrine of the Eighth Imam that are increased to 40 million people in the next 15 years, and it has the following basis;

Table 2. different principals of Padideh city

Large cultural complex	Office complex	Flower garden and permanent exhibition of flowers and plants	Indoor amusement park
5-star hotel	Apartment service complex	Large shopping mall	Amusement complex and water park

This complex has many visitors and spatial users due to having different functions and supporting various activities and vast area that if we can bring ecological elements into it through development stimulus projects, it will play a significant role in maintaining the environment and it will increase the mental scheme in the audience of this building.

4. Results

In the qualitative section, first the experts were asked to start answering the semi-open interview questions based on seeing the documents related to the Shandiz multifunctional complex. The questions will be defined based on the definitions of ecological architecture, then the text of interviews is inserted in Atlas Ti Vard, then live coding and interpretation or description are used and it is tried to reduce the factors of the extracted codes (34 codes) by focusing on the ecological architecture and after reduction it will be 31 cases. Spatial arrangement with 26 cases is the most frequent and least repetitive related to privacy with 3 numbers.

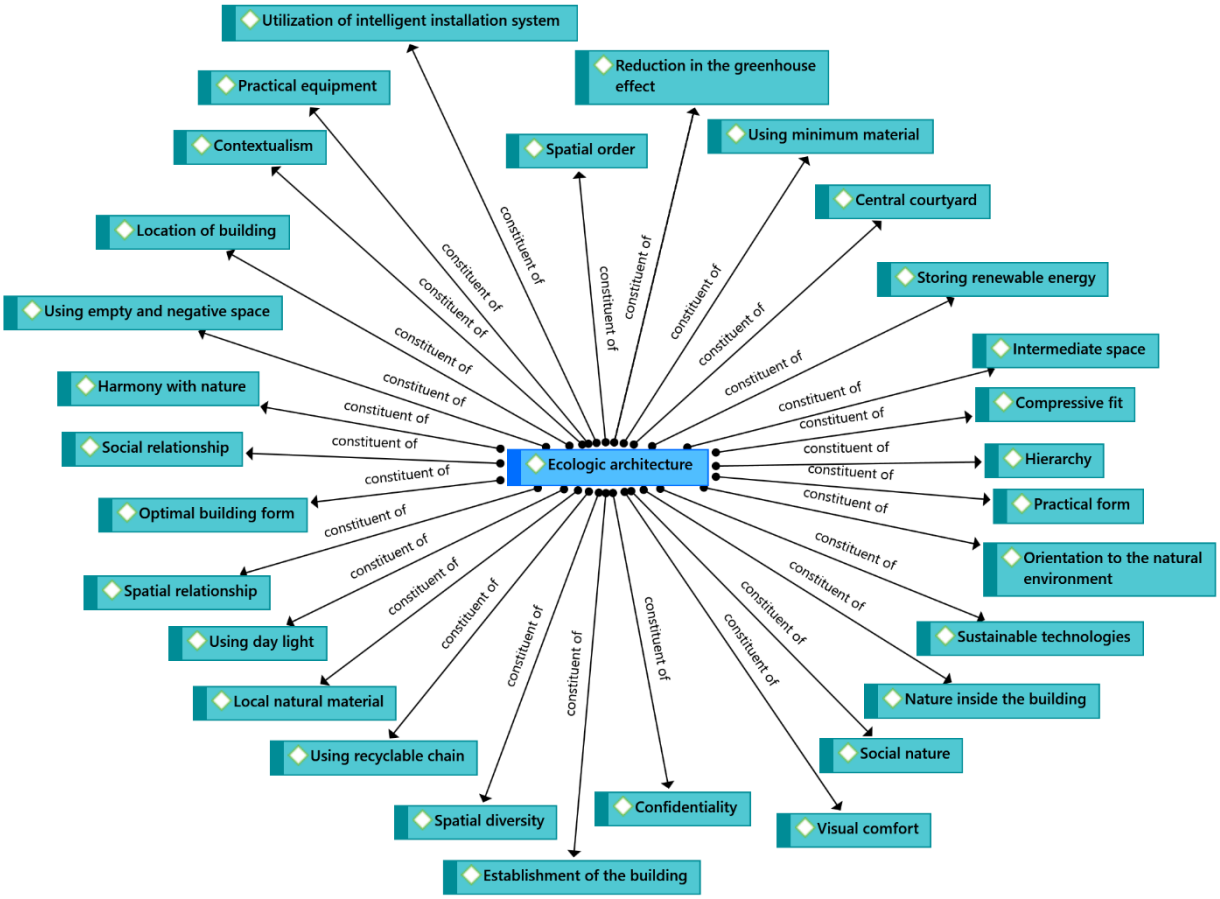


Figure 2. The plot of extracted variables of ecologic architecture

Descriptive statics from 253 people (70.7%) from the population sample were men and 131 people (29.3%) were female and 74.4% were in 20-30 age group. The procedure is that based on the number of components, the questions are written. And each question has an answer between 1 and 5. The sum of the score indicators of a component means the score that each person has given to the desired quality. Therefore, the achievable score of each quality is between 5 to 25 variables. Based on this, we create category. The people who gave 5 to 11 score to a factor totally, estimated that as weak and 12 to 18 score is assumed as average and 19 to 25 is estimated as good. The results of descriptive statistics showed that the highest number of the obtained data from ecological architecture is related to spatial relationship, hierarchy and use of local materials and the lowest is related to orientation to the natural environment. In the group of spatial users, the highest number of components is related to the use of daylight and the lowest is related to the practical form.

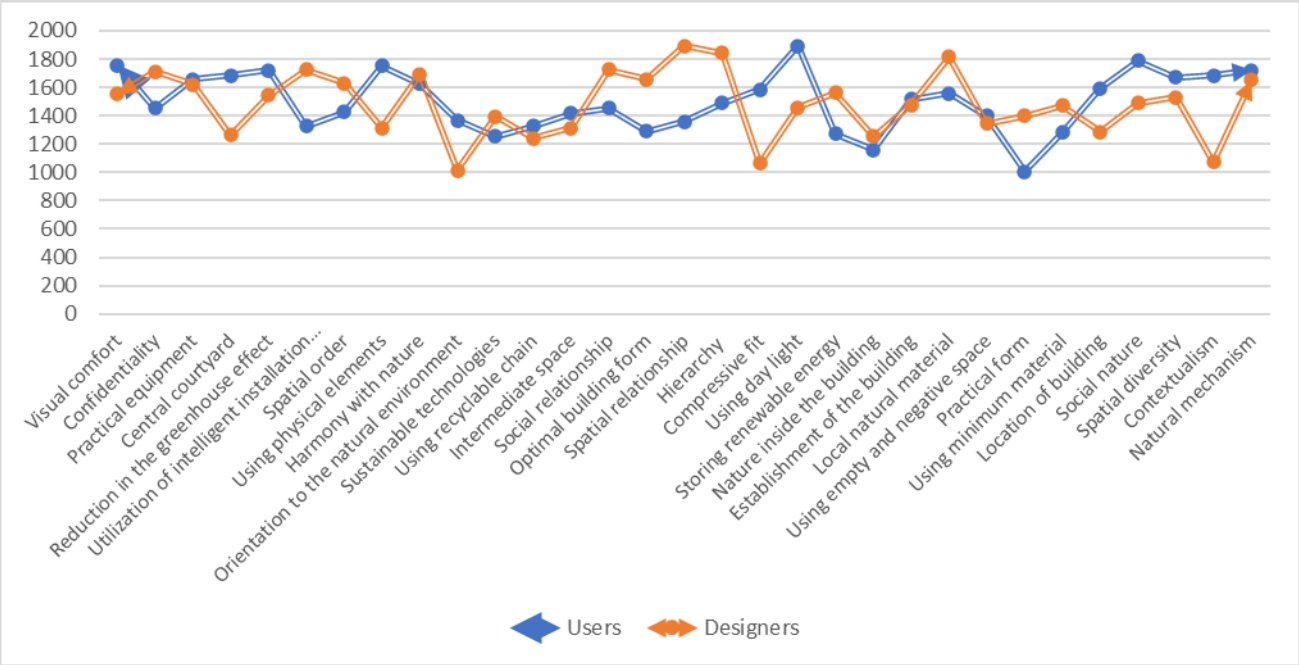


Figure 3. Frequency number of ecological architecture variables

4.1. Illative statistics

4.1.1. Correlation

The results of the questionnaire are entered into Spss25 software after giving numbers. For analysis the prediction relations (regression) and correlation relations are used. Two-Sample Kolmogorov-Smirnov Test is used to analyze the parametric and non-parametric type of data.

Table 3- The Kolmogorov Smirnov test for evaluating the normality of ecologic architecture variable

Variable	Average	Standard deviation	Z Kolmogorov Smirnov	P
Ecologic architecture	27.77	3.23	0.793	0.314

As it is seen in the above tale, the Kolmogorov Smirnov test was used for scoring the meaningful ecologic architecture components (p=0.314) and therefore they do not have normal distribution and nonparametric analysis should be used.

4.1.2. Spearmen correlation

The above table shows the correlations between the variables. As can be seen, there is a significant positive correlation between ecological architecture and its components at the level of 0.01 in both space users and designers and experts. In ecological architecture, according to the designers, the highest correlation is related to the local natural materials (0.916) and the lowest is related to spatial relationship with value of (0.429). According to space users, the highest correlation between local natural materials (0.943) and the lowest correlation between spatial relationship (0.411) is for ecological architecture.

Table 4- correlation between ecological architecture variables

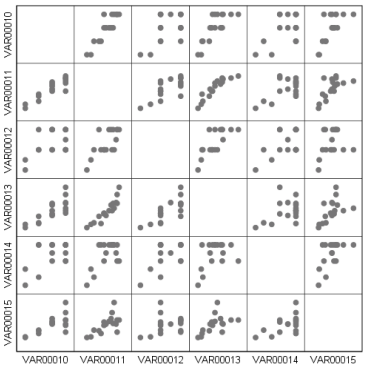
Dimension	Variable	Spatial user		Designers and experts	
		Correlation coefficient	Meaningful level (sig)	Correlation coefficient	Meaningful level (sig)
Ecologic architecture	Visual comfort	0.464	0/000	0.743	0/000
	Confidentiality	0.781	0/000	0.574	0/000
	Practical equipment	0.645	0/000	0.744	0/000
	Central courtyard	0.653	0/000	0.739	0/000

	Reduction in the greenhouse effect	0.746	0/000	0.675	0/000
	Utilization of intelligent installation system	0.473	0/000	0.569	0/000
	Spatial order	0.631	0/000	0.746	0/000
	Using physical elements	0.683	0/000	0.807	0/000
	Harmony with nature	0.473	0/000	0.542	0/000
	Orientation to the natural environment	0.623	0/000	0.654	0/000
	Sustainable technologies	0.536	0/000	0.875	0/000
	Using recyclable chain	0.720	0/000	0.889	0/000
	Intermediate space	0.425	0/000	0.733	0/000
	Social relationship	0.480	0/000	0.429	0/000
	Optimal building form	0.415	0/000	0.714	0/000
	Spatial relationship	0.411	0/000	0.622	0/000
	Hierarchy	0.443	0/000	0.511	0/000
	Compressive fit	0.711	0/000	0.652	0/000
	Using day light	0.562	0/000	0.751	0/000
	Storing renewable energy	0.745	0/000	0.689	0/000
	Nature inside the building	0.615	0/000	0.619	0/000
	Establishment of the building	0.465	0/000	0.744	0/000
	Local natural material	0.943	0/000	0.916	0/000
	Using empty and negative space	0.605	0/000	0.735	0/000
	Practical form	0.517	0/000	0.855	0/000
	Using minimum material	0.476	0/000	0.752	0/000
	Location of building	.674	0/000	0.711	0/000
	Social nature	0.455	0/000	0.625	0/000
	Spatial diversity	0.831	0/000	0.674	0/000
	Contextualism	0.742	0/000	0.588	0/000

Multivariable regression:

For using linear or multivariable regression, the internal correlation matrix of variables is used. After drawing the plot of correlation matrix, it was cleared that the factors do not have linear relation hence, using multivariable regression is correct.

Considering the results of the regression table, it was found that in the view of spatial users, the components of ecological architecture affecting the multifunctional complex of Shandiz are the use of physical elements, hierarchy, renewable energy storage with a value of (1,000) and the lowest is for the effect related to the use of empty and negative space with a value of (0.211) and the least effective is social relations with value of (0.221).

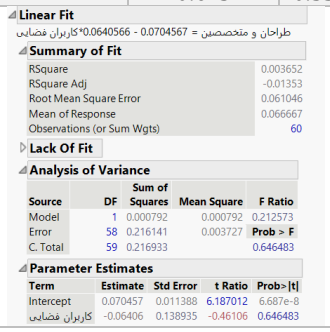


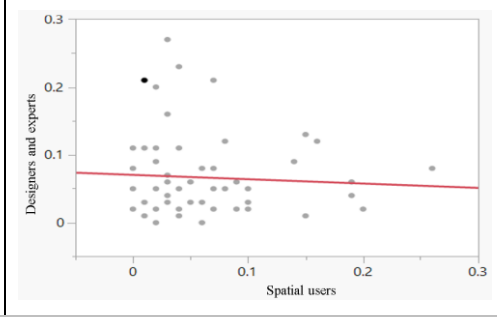
Plot1. Correlation matrix of factors

Table 5- Multivariable step-by-step regression in two group of designers and spatial users

	Scale	Designers and experts				Spatial users			
		Determining coefficient	β	B	F	Determining coefficient	β	B	F
Ecologic architecture	Visual comfort	0.867	0.741	1.000	314/217	0.615	0.781	1.000	527/222
	Confidentiality	0.895	0.429	1.000	523/147	0.451	0.723	1.000	405/122
	Practical equipment	1.000	0.623	1.000	852/381	0.846	0.662	1.000	217/343
	Central courtyard	0.825	0.685	1.000	298/921	0.746	0.648	1.000	199/943
	Reduction in the greenhouse effect	0.712	0.621	1.000	247/257	0.762	0.664	1.000	201/612

	Utilization of intelligent installation system	0.786	0.652	1.000	644/321	0.383	0.662	1.000	643/623
	Spatial order	0.945	0.612	1.000	845/523	0.753	0.652	1.000	849/683
	Using physical elements	0.585	0.381	1.000	754/254	1.000	0.665	1.000	349/603
	Harmony with nature	0.965	0.484	1.000	124/541	0.571	0.483	1.000	184/945
	Orientation to the natural environment	0.744	0.464	1.000	232/241	0.700	0.464	1.000	276/748
	Sustainable technologies	0.885	0.421	1.000	201/321	0.795	0.452	1.000	199/943
	Using recyclable chain	0.723	0.631	1.000	443/124	0.893	0.463	1.000	499/034
	Intermediate space	0.358	0.124	1.000	522/134	0.467	0.662	1.000	673/643
	Social relationship	0.221	0.311	1.000	229/265	0.750	0.720	1.000	489/782
	Optimal building form	0.721	0.325	1.000	323/412	0.674	0.543	1.000	489/782
	Spatial relationship	0.946	0.425	1.000	441/211	0.567	0.420	1.000	489/782
	Hierarchy	0.821	0.223	1.000	321/541	1.000	0.663	1.000	382/412
	Compressive fit	0.885	0.529	1.000	621/991	0.723	0.410	1.000	656/782
	Using day light	0.675	0.679	1.000	581/920	0.467	0.662	1.000	673/643
	Storing renewable energy	0.754	0.628	1.000	218/654	1.000	0.720	1.000	645/715
	Nature inside the building	0.756	0.542	1.000	752/382	0.674	0.541	1.000	546/712
	Establishment of the building	0.561	0.574	1.000	514/321	0.567	0.394	1.000	318/732
	Local natural material	1.000	0.456	1.000	428/167	0.735	0.681	1.000	218/654
	Using empty and negative space	0.565	0.517	1.000	431/175	0.211	0.921	1.000	752/382
	Practical form	0.727	0.603	1.000	154/425	0.744	0.425	1.000	514/321
	Using minimum material	0.631	0.518	1.000	131/421	0.821	0.374	1.000	428/167
	Location of building	0.669	0.361	1.000	314/217	0.947	0.316	1.000	431/175
	Social nature	0.895	0.919	1.000	523/147	0.851	0.983	1.000	154/425
	Spatial diversity	1.000	0.765	1.000	852/381	0.409	0.828	1.000	131/421
	Contextualism	0.625	0.338	1.000	298/921	0.235	0.681	1.000	461/222





Correlation between the components in designers and experts and the spatial users

5. Discussion

The type of the view of spatial users and designers obtained by correlation results between their answers in ecologic architecture factors in multifunctional complex in Mashhad city have many differences. Because the correlation coefficient between answers is (0.003) which shows no relation between answers. Both groups consider the use of local natural material effective than other factors and

they can grow other factors by their configuration. We can use them for developing stimuli projects in this project. But spatial relationships could not affect other variables as well in the view of users and intermediate space that mention the existence of separation in spatial and physical dimensions.

Based on the regression results, the use of objective and visible components for space users has higher coefficients and it can have a more ecological appearance in showing this building. However, spatial components such as the use of empty and negative space have lower coefficients, but the designer group refers to both objective and non-objective aspects that have been used ecologically in the design. Considering these results, evaluating the physical aspects in multi-functional buildings can create more ecological architecture.

In previous studies, some studies have considered only the environmental aspect and some studies have considered this effect in structural and form patterns, and some other studies have considered only the use of climatic functions in building ventilation, technology, and energy systems. But the present study examines the factors and indicators affecting ecological architecture from the point of view of designers and space users in multifunctional buildings, all biological needs including form, structure, energy, environmental comfort, and social and economic needs have been considered. . Then the effect of each component was analyzed. This research is converging with the theories of "Daneshgar Moghaddam" in considering the physical components of space, spatial structure, nature of users' activities, configurations of social and cultural structures.

6. Conclusion

It's been years that ecologic and biophilic architecture are considered in the design process and constructing various buildings with different uses, academic, cultural, commercial and service, in the developed countries. The researches, studies, and implemented projects indicate the application of the ecological and biophilic architectures principles causes the improvement of the building quality in terms of environment, function, structure, etc. But the main concern of the present study is the method to apply these principles in the architecture of multifunctional buildings in Iran to enhance their quality.

In general, this study intends to study and organize the components of ecosystem architecture through social attitudes as well as theories in the field of architecture and environmental psychology, and through the study of common social factors governing social relations, values and Activities, in the best way in the architecture of multifunctional buildings to have positive effects in terms of improving the quality of the environment, since the use of scientific findings whose main concern is to understand the mechanism of interaction between the environment and its operators, such as psychology The environment and the reading of ecosystem components provide the designer with a wide range of possibilities to adapt the environment to the users.

Considering the studied parameters in this research, it was cleared that the multifunctional complex of Mashhad Padideh has used the ecological architecture in its complex but it has described the spatial dimension less and it considers the physical aspects of space more than other aspects. The failure between the opinions of designers and space users can indicate the use of sustainability and environmental components in order to preserve the natural environment and control the man-made environment. Their synchronization with each other requires education in the whole community and it should be considered as a social norm and all people should tend to follow it.

Besides this, emphasizing on smaller spatial dimension in rooms and using materials with higher heat capacity like brick, plaster, thatch, double roof and wall thickness, number and dimensions of openings, adjacent rooms and their direction of location can increase thermal comfort. While, standards and regulations of new texture around the old texture is constructed based on economic benefits and disregard to the natural environment, climatic, social and physical conditions around them. Hence, buildings do not have climate function and their shell are the same regardless to their location. In fact, many ecological aspects have not been considered. In other words, in this complex by following the local topography, geographical location, climatic properties, formation of building based on cultural, economic and social characteristics, attention to spatial organization based on culture and identity are the most optimal responses of man-made environment in the interaction with natural environment in this multi-functional

complex in Mashhad. For improving the conditions in multifunction complex, the following approaches are proposed:
- Using spatial hierarchy for thermal control in space with lower importance to higher importance.
- Determining regulations for using empty space (central courtyard) and negative space appropriate with climate.
- Using natural elements to increase the environmental perception in open and semi-open spaces and also using more cohesion in the man-made and natural environments.
- Using internal green space for internal and outside spatial cohesion and intellectual continuity of spatial audiences in natural spaces.
- Optimized spatial configuration and adjacent spaces by interaction of users in the environment to understand the natural environment.

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