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In the Name of God

Dear Readers,

I, on behalf of the editorial board, am proud to present this 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 May – June 2024.

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 issue.

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

Sincerely,

Dr. Abolfazl Davodi Roknabadi
Editor-in-Chief
International Journal of Applied Arts Studies (IJAPAS)
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Extraction an Evaluation of Physical-Behavioral Components taken from Native Patterns (Case Example: Kerman Bazaar Complex)

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Research Article

Abstract

The formation of the body of any space can be derived from the prevailing behaviors and diverse lifestyle patterns and the physical support of the type of space from specific activities or diverse uses. Each space has a different meaning that emerges based on the body that surrounds it. Traditional markets as the support of commercial centers have components that are derived and show the physical design and spatial behavior that are directly related. This research was formed with the aim of extracting physical-spatial components and classifying them in the markets of Kerman.

The research method is a combination of nested qualitative and quantitative type. In the qualitative part, semi-structured interviews with scholars and snowball sampling are used, in which 28 experts are interviewed. In order to reduce the data, coding is used in ATLASTI software. It is a causal-comparative quantitative method that uses the components of the previous stage to develop a questionnaire and distribute it among 384 space users. The results are entered into the GRAPHER 16 software for analysis and are analyzed with inferential statistics. The results show that the most important factors in the body-behavior components in the formation of the traditional market of Kerman city include the response of the wise in the form, the support of the body to the activity, the cover Plant is with a value of (1.000) and the lowest factor contribution is related to inviting elements with a value of (0.295). Also, all the components have a significant relationship to explain

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the factor contribution, except for the flooring component, whose factor contribution is (0.467) but it does not have a significant relationship. To facilitate the review of the results, a summary chart of the determined coefficients has been presented.

Keywords: Phyical-Behavioral Components; Native Patterns; Kerman Market Collection; Combined Method

1. Introduction

In the last century, man has assumed himself to be in control of the environment he creates and has forgotten that he is surrounded by the environment. That is, the environment he is shaping surrounds and encloses him (Shahcheraghi and Bandarabad, 2017: 16). By using the knowledge of environmental psychology, it is possible to make an assessment before design and construction, which is considered the best tool for professional designers. If we know what has performed better in the past, for better design in the future. We will be more prepared. Also, this science can be used in the investigation of historical architectural works and the analysis of the impact of mutual relations between man and the environment in traditional architecture and use the advantages of such science in knowing these places (Pakaz, 2006: 398).

Today, the architectural community aims to heal the lost hope in today's architecture by looking at the past in its designs, because the dullness of modern designed spaces indicates that traditional architectural elements and methods have been a more suitable answer for users. In the studies conducted on native architecture, culture, climate, and people are important factors that shape this type of architecture, which fulfills the relationship between man, environment, and nature in the best way. In modern constructions, we have started to design with complete disregard for the climate, culture, and needs of the users and we have faced the failure of the project. The relationship between man and the environment has been studied in many domestic and foreign researches, which have been explored in various locations such as residential, commercial, neighborhood centers, etc. It considers it necessary to create a stable behavior place, in the current research, shopping centers are chosen as the research platform for the shopping component, which is a requirement for the presence of every person in the society.

Today, in most of the contemporary commercial spaces, we witness the dullness and inefficiency of the space, on the other hand, the valuable historical market, which has a rich body, is devoid of social presence or a place of presence and trade of foreigners and foreigners, which causes the loss of the original identity. It has become a historical market. Kerman Bazaar, one of the historical markets of Iran, which has two axes, east-west and north-south, has suffered functional decline and lack of identity in the north-south axis, which prompted the researcher to examine the physical and social factors in the axis East-West, which still retains a part of its identity, is a model for the development and revitalization of historical markets that have lost their identity, or in future researches, to seek to formulate commercial space design criteria. With the aim of extracting body-behavior components derived from native architecture, this research tries to answer the question what are the physical components affecting spatial behavior in the architecture of the traditional bazaar of Kerman city and which one has a greater contribution?

2. Theoretical Foundation

2.1. Local Architecture

The word "indigenous" is derived from the Latin vernacular and means "native, indigenous, from the region". This word is probably derived from an old Etruscan word (Iranmanesh et al., 2014: 352). In linguistics, this term refers to the term "mother tongue", which is a language belonging to a specific time, place, or group (Dost Mohammadi et al., 2021: 16). In architecture, it is attributed to a style of architecture that is native to a specific time or a specific place (not imported or copied from another region). This architectural style usually refers to residential buildings (Khaleghi, 2019: 25).

Today, native architecture is considered as a vessel and a legacy of the past, the legacy of uneducated people who used architectural elements to create architecture (Flamaki, 2005: 12). Native architecture means a collection of architectural and urban planning units that have come together in the land and with coordination in the field of shape, volume or "volunometric plan" in the field of applications, coloring and composition of full and empty surfaces, as well as in the field of materials and all building systems that are in It is the main element of the phenomenon. (Falamaki, 2005: 17). Native architecture is a usable example for sustainable architecture due to popular construction technique and collaborative construction patterns (Akrami and Damiyar, 2016: 38). Vernacular architecture is the wise thinking of a generation shaped by the culture of a particular region in which it flourished. Native design is the crystallization of limitations imposed by regional and cultural guidelines in the puzzle of a region. Or somehow, teaching to live with these limitations by using the maximum potential power is considered a canvas; Therefore, native architecture is the result of the factors that shape it (Akrami and Damiyar, 2016: 34).

Vernacular architecture mainly refers to a type of architecture that originates from informal local traditions and is not expressed by a specific designer. Native architecture is a type of architecture that is formed based on the needs of users and reflects local traditions (Alpagonolo and Flameki, 2015: 36). Vernacular architecture is formed based on the needs of the residents of a region and the limitations of the climate (Tabatabai and Sabernejad, 2015: 70) and its related technologies play the highest influence in the issue of sustainability due to attention to the background and context of design (Jafari and Mahdavipour, 2013: 51). Vernacular architecture is an architectural style that is formed based on local needs, availability of building materials, and local traditions. At least in the beginning, there was no formal education for people and it was implemented only by relying on local design skills and the tradition of local builders (Khaleqi, 2019: 25).

Gibson (1979) relates the concept of environmental capability to some of his previous concepts. As Kafka (2009) also believed; Objects have a requesting or inviting quality, for example, according to Louis Kahn, a brick wants to be an arch. So; It turns out that in order to design a space or live in it, one cannot ignore its behavioral and functional background. In this context, Flameki (2015) states:

"Native architecture means a collection of urban architectural units that have come together in a certain land and have harmony based on difference, identification based on rules and customs and tastes born from environmental culture and... and unwritten but living contracts". Native architecture has evolved over time based on the environmental, cultural, technological, and historical background in which it has existed, and it has been randomly put together with elements of design style for aesthetic purposes that go beyond the essential needs of the building (Flameki, 2014: 28).

2.2. Environment and Behavior

John Lang also expands the knowledge of the behavioral environment and tries to build a theory based on behavioral studies for the design of human-made environments. According to John Lang, the main indicators of the behavioral realm are: a pattern of behavior that is always repeated and a platform with a sense of the special presence of that behavior and its co-construction means the appropriate link between the behavioral pattern and that context of a specific time frame, in other words, equal to this definition, if permanent and different behavioral patterns appear in a specific behavioral context at specific times, that environment It is considered as a separate behavioral camp (Lang, and Guba, 2000: 128), this view of Lang can be seen.

It can be classified into three groups, each of which requires different characteristics in the physical environment, essential activities, optional activities and social activities, and compulsory activities, a person is forced to perform these activities in any situation. Because such activities are mandatory. It accepts the least impact from the material environment and public space because it is done on all days of the year and under any conditions. If the external environment has a low quality, people will only do the necessary activities; And where the quality of space is high, in addition to doing essential activities, their desire to be in the environment and prefer walking to fast passing by car increases. Voluntary activities, such activities do not have a vital aspect and are carried out in conditions that provide a favorable environment for them, such as recreational activities, and social activities, performing these activities depends on the presence of other people in the space, and basically, they are not possible outside of a collective form; Like play, children meet neighbors and gain locality (Gehl, Gemzoe and Kirknaes, 1987). Yan Gel knows the amount of these activities in the environment and urban space in relation to their quality.

2.3. Relationship Between Behavior and Environment (Ecological Psychology)

Experts in the definition of the environment, between various words; Physical environment, social environment, psychological environment, and behavioral environment are distinguished. For this reason, architects, psychologists, sociologists, and geographers provide different definitions of the environment according to their needs. "Environment is a complex concept, which has various dimensions. Spatial data, social, cultural, physical, architectural, symbolic, geographical, historical and biological aspects are considered important aspects of the environment" (Lawrence, 2005: 102).

Therefore, the environment (space) is like a container for the social activities and behaviors of citizens. Human spatial behavior, from the perspective of urban design, is a concept that describes the relationship between the built environment and the people living in it. "Good" spatial behavior is an indicator of successful urban design, while "bad" spatial behavior can be an indicator of wasted resources and the reason for residents' dissatisfaction. Therefore, behavior is a kind of language to communicate between humans and their tangible environment (Ferguson and Derek, 2016: 199).

In traditional psychology, psychologists relied on the general issue of human behavior and did not pay attention to the relationship between human behavior and the environment. The consequences of neglecting the effects of the environment on behavior and the emergence of modern architectural movements criticizing the boring, crime-prone, and unpleasant spaces formed in modern cities became the basis for the emergence of environmental psychology. Environmental psychology is a way to understand the relationship and two-way interaction between humans and the environment. Because he believes that none of these two cases can be investigated alone. For the first time, Roger Barker and his colleagues defined the interaction of the two fields of

behavioral sciences and architecture as "environmental psychology", which seeks to translate the relationship between humans and the environment into the language of architecture and environmental design. By analyzing and investigating this relationship, the environment can be designed according to people's needs and characteristics (Schaumann et al., 2016: 26).

The background of "environmental psychology" dates back to the late 20th century. Proshansky, Etelsen, and Rivlin announced the emergence of environmental psychology in a book entitled "Environmental Psychology: Humans and the Socio-Physical Environment" (Einifar, 2015: 45). The following table shows the definitions of environmental psychology by experts:

Table 1 Definitions of environmental psychology (Source: author)

Name	Year	The given definition of environmental psychology
Craik	1970	Psychological study of human behavior in a way that is related to her daily life in the physical environment
Graumanm	1976	Environmental psychology is complementary to general psychology without environment.
Canter	1981	It is a branch of psychology that pays attention to the study and analysis of human interactions, confrontations, experiences and actions with various aspects of the social and physical environment.
Russell	1982	It is a field of psychology that deals with providing a systematic relationship between the person and the environment.
Holahan	1982	Environmental psychology examines the common relationships between the physical environment and human behavior and experience.
Proshansky	1990	Environmental psychology deals with interactions and relationships between people and their environment.
Gifford	1997	Environmental psychology is a mutual study between a person and her physical location.

2.4. Influence of the Environment on Behavior

Designers and architects are among the most important people whose works and creations affect human behavior in shaping the physical environment. According to his needs, values, and goals, man transforms the environment and is reciprocally affected by the transformed environment; advanced technology causes the human impact on the environment to intensify and speed up. In fact, the environment is a container, and man is considered a container. As containers in space, humans show different behaviors in dealing with the environment; behaviors that can be categorized based on different approaches (Schaumann et al., 2016: 26)

Based on this, two very important factors are influential in the type and manner of behavior: the environment (the information obtained from it) and the individual (with all his characteristics). Therefore, behavior is a result shown in Figure 1:

Fig 1 Behavior outcome diagram

Therefore, it is clear that our activities can take different forms under the influence of these factors (environmental and personal). Also, the behavior is the product of the environment and the

interaction of the two with each other. Various physical factors, including noise, weather, and enclosed spaces, continuously affect humans and their movements. These movements and reactions are called behavior. John Lang believes that regarding the relationship between environment and behavior, four theoretical positions can be distinguished: discretionary approach, possibilistic approach, probabilistic approach, and algebraic approach (Pakzad, 2006: 221).

Table 2 Descriptions of various approaches in relation to the environment and behavior (Source: author)

A variety of approaches	Description
Optional approach	In this approach, the environment has no effect on human behavior. Considering that there are serious limitations to human behavior, this approach is indefensible.
Feasibility approach	Possibilists see the environment as a provider of human behavior and a little more than that. This approach considers the environment as a set of behavioral opportunities according to which an action may or may not have occurred. According to the belief of determinism, when people act freely, they are actually controlled by the environment and heredity.
Probabilistic approach	The environment is only able to provide the context and probability of a certain behavioral or perceptual event and is not able to determine the behavior definitively, and therefore, man is free to choose the environmental conditions. In this theory, the environment increases the probability of certain behaviors due to specific physical conditions, in other words, the environment creates conditions that increase the probability of certain behaviors compared to others. Here, diversity and the right to choose are discussed.
Determinism	This approach considers the environment to be the determinant of human behavior. In this theory, the environment is assumed to mean the geographical or terrestrial environment. This approach considers the environment-behavior relationship as a causal relationship.

In fact, the determinism of environmental determinism is based on the fact that changes in the nature of geographical, social, and cultural environments and natural or artificially built environments can lead to changes in human perception and behavior, and humans are subject to environmental conditions. The environmental enabling theory is based on the fact that the environment provides a set of potential capabilities for some behaviors and that humans are not 100% subject to the environment and have relative choices. Of course, the ability of the environment does not necessarily lead to a specific behavior, but if there is no ability in the environment, the behavior will definitely not be realized. In this theory, the environment provides possibilities or limitations, and behavior is formed based on cultural issues (Lorenz, 2006, 103). So; Any physical environment can consider one of the three approaches as the dominant approach in design and predict the desired behaviors according to it. So; In line with the two-way design of behavior and place in the urban space, it is necessary to examine the concept of behavioral accommodation or the place where a behavior occurs (Ferguson, and Derek, 2016: 199).

2.5. Body and Behavior

The environment (architectural environment) must meet human needs and match the needs of the user (Lawrence, 2005). However, what architects create is a potential environment for human behavior; What a person uses is its effective environment, the environment, the architecture where the main life activities of any society take place has a dominant and permanent influence on the user of this environment. Nevertheless, people do not only try to passively leave their environment, but they actively in order to cope with their needs individually or collectively, leading to specific mutual effects on their environment over time, and these effects Depending on the conditions and

people, is different (Abdel Kader, and Adbel, 2006: 3), in this regard, the surrounding environment is the field of behavior and reaction. "Our spirit and behavior can only be understood if it is understood from the point of view of the environment and behavior." Therefore, the relationship between the surrounding physical environment and behavior is deeply rooted and intertwined, Mary V. Connexted in her recently published book titled Interior Design and Beyond, explains how interior design affects human behavior. He believes that interior designers have a moral responsibility towards the future culture for designing interior spaces that positively affect the quality of relationships between people and their social and physical environment. and human behavior in every design process, both now and in the future, in every space, must be carefully examined by designers. To achieve this goal, designers must understand the main meaning of behavior through specialized scientific methods. In environmental psychology, behavior is an innovative activity that occurs as a result of activities inside and outside the space, so every environment has abilities that are suitable for experiences and behavior. Man is presented. This main process related to the relationship between man and the environment is formed based on it.

Man begins to recognize the surrounding physical environment based on patterns. These patterns are almost innate and partly learned. They form the link between perception and cognition and guide not only cognitive processes but also affective responses and local behavioral actions, which in turn influence plans, known as behavioral outcomes. According to the mentioned materials, it is possible that the spatial characteristics of architecture affect human behavior. This is empirically supported by the statement of numerous studies that have investigated the selected features of space in human spatial behavior. For example, Wiener and Mallet (2003) studied the influence of environmental areas on human spatial behavior and path planning. Based on the mentioned contents, the following conceptual framework is shown in Figure 2.

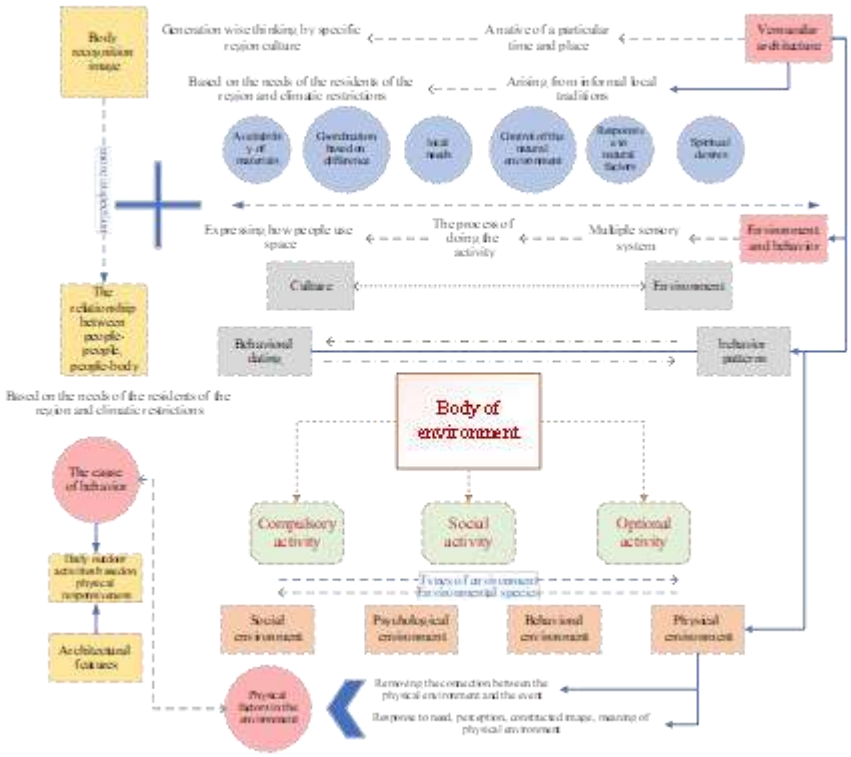


Fig 2 Basic concepts in the representation of the environment and the body in the field of behavior

3. Research Methodology

In terms of type, this research is applied, and in terms of the combined method, qualitative and quantitative nested. In order to reach the answer to the research, a review of the theoretical literature in this field is done first, and the concepts and definitions of the body-behavior components taken from the native architecture are extracted. Then, in order to extract and evaluate the body-behavior components taken from local patterns taken from the traditional market of Kerman City, a semi-structured interview is conducted. It is converted to text and entered into ATLASTI software. Interviews continue until theoretical saturation and semi-structured interviews are conducted with 28 people, and to extract the components, labeling, and open coding are done with the approach of description and interpretation. After this stage, to screen the components, the concept of affected physical components is used to support the behavior, and for high validity, the panel of experts is asked that the components be based on indicating local patterns in the traditional market complex of Kerman city, with a system of giving them numbers between 0 to give 1 and the components that failed to reach the average are removed. After extracting the codes and categorizing them, one question is developed for each component in the questionnaire with a Likert scale. This stage is the beginning of the quantitative part. Then the questionnaires are randomly distributed among the space users due to the uncertainty of the number of people and the statistical population for the sample size, 384 people are selected which is the upper limit of the Morgan table. The results are entered into the GRAPHER16 software and subjected to inferential and descriptive statistical analysis. 20 experts and with a CVR formula equal to 0.78 and reliability was calculated with Cronbach's alpha, whose value is 0.74.

Fig 3 Research process

4. Scope of Study

4.1. Kerman Bazaar

Kerman Grand Bazaar starts from Arg Square and ends at Mushtaqiye Square. Each part of the Kerman market was built during the time of one of the rulers of this city and because of some of its features, it is unique in Iran and has world fame. This bazaar is considered to be the longest bazaar in Iran and was mainly built after the 8th century AH. This work was registered as one of the national works of Iran on 25 May 2001 with registration number 3856. The big market of Kerman consists of different parts, some of them, such as Vakil Bazar, Faqi Bazar, Ganjali Khan Bazar, etc.,

are part of the market, and others, such as Qala Bazar, and Sardar Bazar, etc. are on the way to the big market. whose elements are listed in the Table 3.

Table 3 Introducing the components of Kerman Bazaar

Bazaar components	Introduction	Pictures
Argh Bazaar	The first part of the market is Arg, which starts from Arg square and continues to four souqs of Ganj Ali Khan. This market is divided into two sub-sections called "Nagarkhane Bazaar" and "Saraji Bazaar."	
Chahar Souq of Ganj Ali Khan	The intersection of two market lines is called Chahar Souq. Due to the intersection of the two lines of the bazaar in the place of Chahar Souq Ganj Ali Khan, in the past this place was considered the most important and busiest point of the city. At this intersection, Ganj Alikhan Bazaar, Arg Bazaar, Mesgari Bazaar and Castle Square Bazaar meet. These four souqs are part of Ganj Ali Khan complex. The interior of these four souqs with interesting stucco and oil paintings, even though 400 years have passed since they were painted, they have still preserved their beauty. Before the arrival of new architecture and the interference of western architecture, the domes of the bazaar were connected as a band. It is considered one of the highest buildings in the city after the Grand Mosque and one of the highest domes in the city.	
Ganjali Khan Bazaar	Ganj Ali Khan Bazaar is the boundary between the four souqs and the optional bazaar. It remembers a very interesting architectural style from the Safavid era and is located in the southern part of Ganj Ali Khan square. On the right side of this market, there is a historical and beautiful bath of Ganj Ali Khan and eighteen shops, and on the left side of it are designed arches that show a beautiful view.	
Optional Bazaar	Optional Bazaar is the fourth part of the market in Kerman, which starts from the end of the southern Ganj Ali Khan Bazaar and extends to the first market of Vakil. The elements in this part of the market can be mentioned Sheikhiyeh School, Golshan Caravanserai, three Sardari Bazaars and at the end of it, Vakil Hammam or traditional tea house.	
Kerman lawyer Bazaar	Kerman lawyer Bazaar is located at the end of the optional market and the Vakil complex. By the order of Mohammad Ismail Khan, the governor of Kerman in 1282 AH. AH (1856 AD) and his son Morteza Qoli Khan Vakil Sani and his children built a large complex including caravanserai, bazaar, bath, mosque, which is still called Vakil and its market is one of the most beautiful markets. The commercial section called Vakil Bazaar was located between the Jame Mosque and the Citadel.	
Sardar Bazaar	Sardar bazaar is in the form of several intersecting bazaars, which are connected to the optional bazaar with three main lines located on the edge of the market. The vast majority of its shops are cloth shops. The floor level of this market is a few steps lower than the market row. This market has a very beautiful architecture.	

Mozaffari Bazaar	Mozafari Bazaar starts from the end of Vakil Bazaar and ends at Mirza Rezai Kermani Street. Mozafari Bazaar is part of Amir Mohammad Mozafar's complex and the phenomena of this part of the market can be mentioned as the Takiya (sefa) of Azakhane, Gadhamgah Bazaar, and Jame Mosque of Kerman.	
Mahmoud Castle Bazaar	Mahmoud Castle Bazaar is the first part of North-South market, located in the southernmost part, the first part of this market is also called Rigabad Gate market. In the past, this market was more important and still old-style blacksmiths can be seen in this part of the Bazaar.	
Castle square Bazaar	Maidan Qala Bazaar starts from Imam Khomeini Street facing Mahmoud Qala Bazaar and ends at Chahar Souq Ganj Ali Khan. Due to its proximity to the eastern and western markets, it is more important than Qala Mahmoud market and has more economic prosperity. Kerman market complex includes other markets as well. Among them, we can mention Gadhamgah Bazaar, Attari Bazaar, Cobblers Bazaar, etc.	
Copper Bazaar	Copper Bazaar is located on the edge of Ganj Ali Khan Square. In this market, you can find shops that offer colorful artistic products and copper carvings.	
Jewelry Bazaar	Zargari bazaar, which is also known as Kayseria, is north-south and starts from the northeast corner of Ganj Ali Khan square.	
Shoemaker's Bazaar	The cobblers' bazaar starts from the end of Haj Agha Ali bazaar and continues parallel to Ibrahim Khan bazaar and ends at Sarai Golshan; And its direction is north-south. This market is covered. Jar Caravanserai is located on the left side and Mirza Hussain Khan Caravanserai is located on its right side. The number of its shops and rooms is more than 160.	
Kolah Mali Kerman Bazaar	Kolah Mali Kerman Bazaar is located between the northern market of Ganj Ali Khan square and the shoemaker's market and has 13 shops. Ganj Ali Khan School is located on the right side of this market, and Ibrahim Khan Complex and one of the doors of Mirza Hussain Khan Caravanserai are located on the left side.	

5. Research Finding

In the summary of all the codes extracted from the interviews conducted in connection with the role of physical components affecting the behavior in the traditional market complex of Kerman city, it is presented as follows. These codes are formed based on description and interpretation. The results are shown in the following steps. At this stage, for the ease of coding, the codebook of components is used that has a deep and meaningful relationship in the direction of the formation of the body and behavior in them.

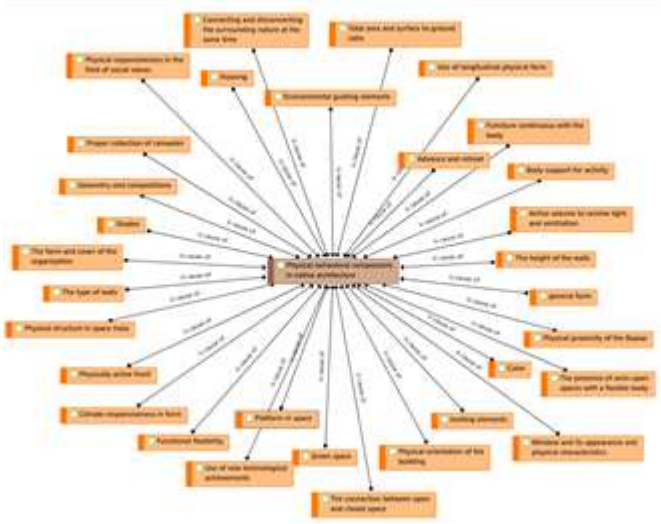


Fig 4 Extracted components from the semi-structured interview based on coded coding

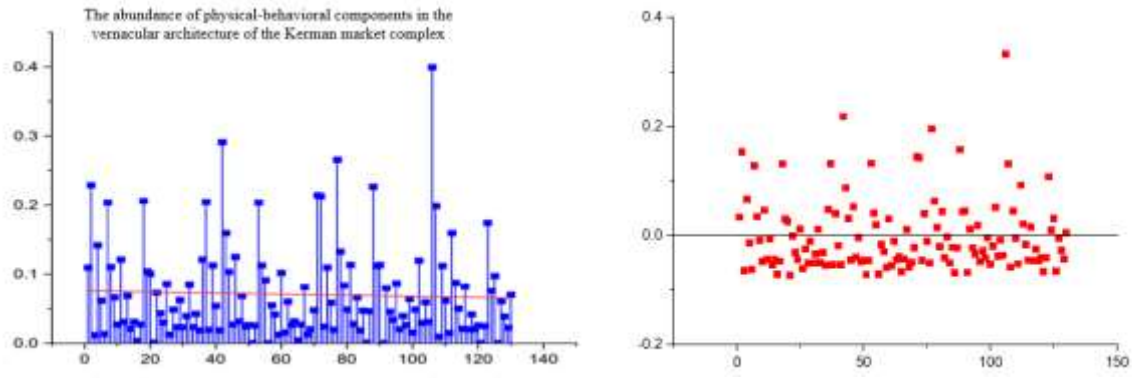
Based on the qualitative findings, 38 codes are extracted, and after summarizing the data, 5 of them are removed, the most prominent being the body support code with the number of 29, and the least prominent is related to green space with the number of 7.

5.1. Quantitative Findings

Descriptive Statistics

The statistical population for this research is the entire space users of the selected and mentioned university building, which was used to find the sample size using Morgan's table; 384 people are selected as the sample size. Questionnaires are randomly distributed. The results show that 39% of the participants are women and 61% are men. The most age group of participants in this research is 54% between 18-22 and 25% between 22-26 and 21% between 26 and 30. The data distribution is shown in Table 4.

Table 4 Data distribution diagram of body-behavior components

Data distribution


Based on the moving average of the data, it is determined that the distribution of the data is lower than the average and a few data have a frequency greater than the average. Accordingly, the components with the highest frequency include functional flexibility, wall height and overall form.

Inferential Statistics

Regression

At this stage, in order to achieve this, to what extent the mentioned components can play a decisive role in determining a behavior, the dispersion matrix is used. For convenience, 15 samples of the components are first entered into the software. And the result showed that there is no linear relationship between the components and the best type of regression to explain the factor contribution is to use multiple regression.

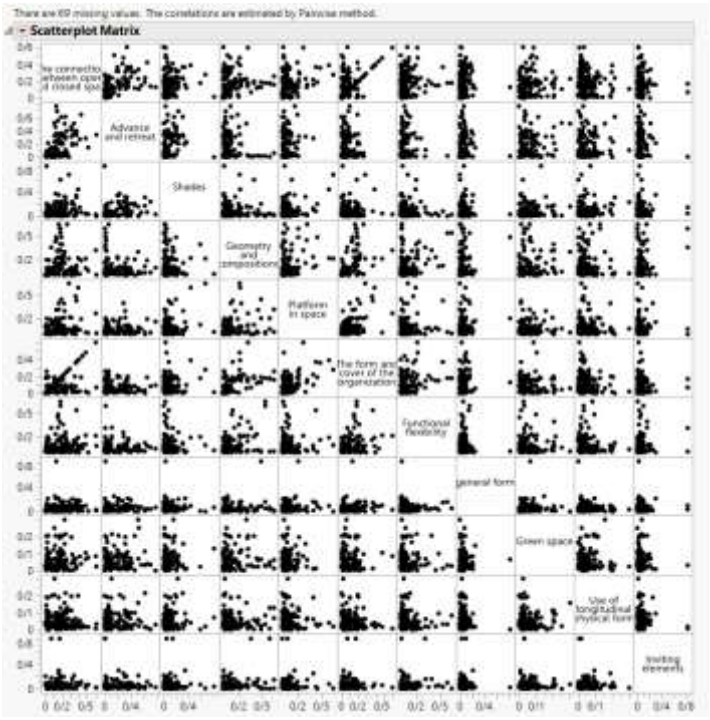


Fig 5 Scattering of data in the data frequency matrix

Multivariate Regression

In multivariate regression, in each step, the independent variable is inserted or removed to finally reach the optimal model. By looking at the above equation, it can be seen that by increasing or decreasing one unit of each factor and keeping the other factors constant, the variables in it are affected to different extents, and the largest factor contribution is in the body-behavior components in the formation of the traditional market of Kerman. It includes climate responsiveness in the form, body support of the activity, overall form with a value of (1.000) and the lowest factor contribution is related to the inviting elements with a value of (0.295). Also, all the components have a significant relationship to explain the factor contribution. except for the component of flooring,

whose factor is (0.467), but it does not have a significant relationship. To facilitate the review of the results, a summary chart of the determined coefficients has been presented. Emphasizes the placement of selected components.

Table 5 Multiple regression results and stepwise regression coefficients

Component	t	β	B	F	Coefficient of determination	Meaningful	Degree of freedom
Connection between open and closed space	46.522	0.781	1/000	257.222	0.615	0.001	383
Advance and retreat	42.152	0.732	1/000	405.122	1/000	0.002	383
Shades	40.223	0.662	1/000	217.434	0.846	0.015	383
Geometry and compositions	38.239	0.648	1/000	199.943	0.746	0.007	383
Platform in space	8.958	0.664	1/000	201.612	0.762	0.008	383
Form and cover of the organization	11.134	0.662	1/000	643.623	0.383	0.005	383
Functional flexibility	18.441	0.652	1/000	849.683	0.753	0.006	383
General form	19.144	0.665	1/000	349.603	1/000	0.001	383
Green space	49.173	0.483	1/000	184.945	0.571	0.004	383
Use of longitudinal physical form	47.963	0.464	1/000	276.748	0.770	0.004	383
Inviting elements	46.226	0.452	1/000	199.943	0.295	0.005	383
Physical responsiveness in the field of social values	47.228	0.463	1/000	499.034	0.893	0.005	383
Type of walls	21.341	0.662	1/000	673.643	0.467	0.002	383
Proper collection of rainwater	25.215	0.720	1/000	489.782	0.750	0.002	383
Physical structure in space mass	19.215	0.543	1/000	425.365	0.674	0.001	383
Height of the walls	18.215	0.420	1/000	418.234	0.567	0.005	383
Body support for activity	20.312	0.663	1/000	382.412	1/000	0.001	383
Total area and surface to ground ratio	25.876	0.410	1/000	656.782	0.732	0.000	383
Flooring	21.341	0.662	1/000	624.314	0.467	0.810	383
Climate responsiveness in form	25.215	0.720	1/000	645.715	1/000	0.001	383
Connecting and disconnecting the surrounding nature at the same time	18.542	0.541	1/000	546.712	0.674	0.008	383
Use of new technological achievements	18.342	0.394	1/000	318.732	0.567	0.007	383
Active volume to receive light and ventilation	21.611	0.617	1/000	155.923	0.672	0.007	383
Environmental guiding elements	21.571	0.542	1/000	569.014	0.598	0.007	383
Color	24.635	0.843	1/000	654.623	0.711	0.001	383

Presence of semi-open spaces with a flexible body	26.574	0.912	1/000	421.754	0.843	0.001	383
Furniture continuous with the body	27.258	0.663	1/000	419.754	0.755	0.002	383
Physically active front	19.635	0.410	1/000	432.543	0.745	0.002	383
Window and its appearance and physical characteristics	35.847	0.662	1/000	485.454	0.422	0.003	383
Physical orientation of the building	28.574	0.720	1/000	652.315	0.751	0.003	383
Physical proximity of the Bazaar	26.914	0.543	1/000	518.765	0.384	0.001	383

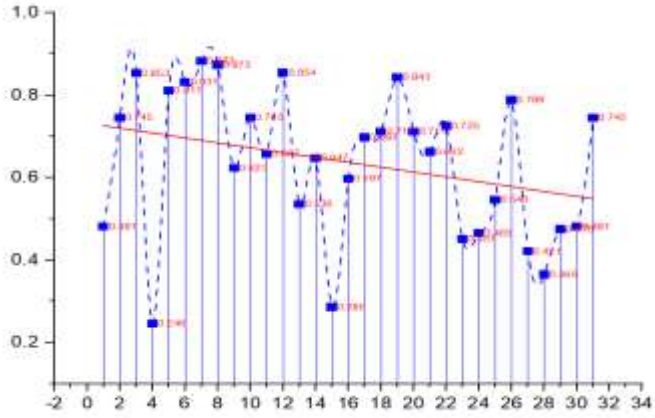
Correlation

The two-sample Kolmogorov-Smirnov Test is used to check the parametric and non-parametric types of data. This test was conducted for each and every component of solitude in the open spaces of the residential complex of Hamadan city and it was determined that due to the non-parametric nature of the data, Spearman's correlation should be used; Therefore, private variables do not have a normal distribution and non-parametric analyzes can be used for them. Based on the results obtained from Table 6, it was found that the lowest correlation is related to the variable of the general form of the building with a value of (0.246), and the highest is related to the lack of aristocracy with a value of (0.883) with other variables.

Table 6 Spearman correlation of physical-behavioral components in the traditional market of Kerman

Components	Degrees of freedom	Meaningful	Correlation coefficient
Connection between open and closed space	383	0.003	0.481
Advance and retreat	383	0.004	0.745
Shades	383	0.010	0.853
Geometry and compositions	383	0.008	0.246
Platform in space	383	0.007	0.811
Form and cover of the organization	383	0.006	0.831
Functional flexibility	383	0.008	0.883
general form	383	0.001	0.873
Green space	383	0.004	0.623
Use of longitudinal physical form	383	0.004	0.745
Inviting elements	383	0.005	0.657
Physical responsiveness in the field of social values	383	0.003	0.854
Type of walls	383	0.005	0.536
Proper collection of rainwater	383	0.007	0.647
Physical structure in space mass	383	0.003	0.286
Height of the walls	383	0.005	0.597
Body support for activity	383	0.001	0.697
Total area and surface to ground ratio	383	0.000	0.711
Flooring	383	0.009	0.843
Climate responsiveness in form	383	0.001	0.711
Connecting and disconnecting the surrounding nature at the	383	0.008	0.662

same time			
Use of new technological achievements	383	0.007	0.725
Active volume to receive light and ventilation	383	0.007	0.451
Environmental guiding elements	383	0.007	0.465
Color	383	0.009	0.546
Presence of semi-open spaces with a flexible body	383	0.008	0.788
Furniture continuous with the body	383	0.007	0.421
Physically active front	383	0.001	0.365
Window and its appearance and physical characteristics	383	0.003	0.475
Physical orientation of the building	383	0.004	0.481
Physical proximity of the Bazaar	383	0.008	0.745



In the next step, PN modeling is used to find out which of the components are able to be grouped with each other due to the degree of correlation, and which components have a greater impact in each questionnaire separately. Results It shows that the 33 mentioned components can be classified into 7 groups based on modeling, which is displayed in Figure 6.

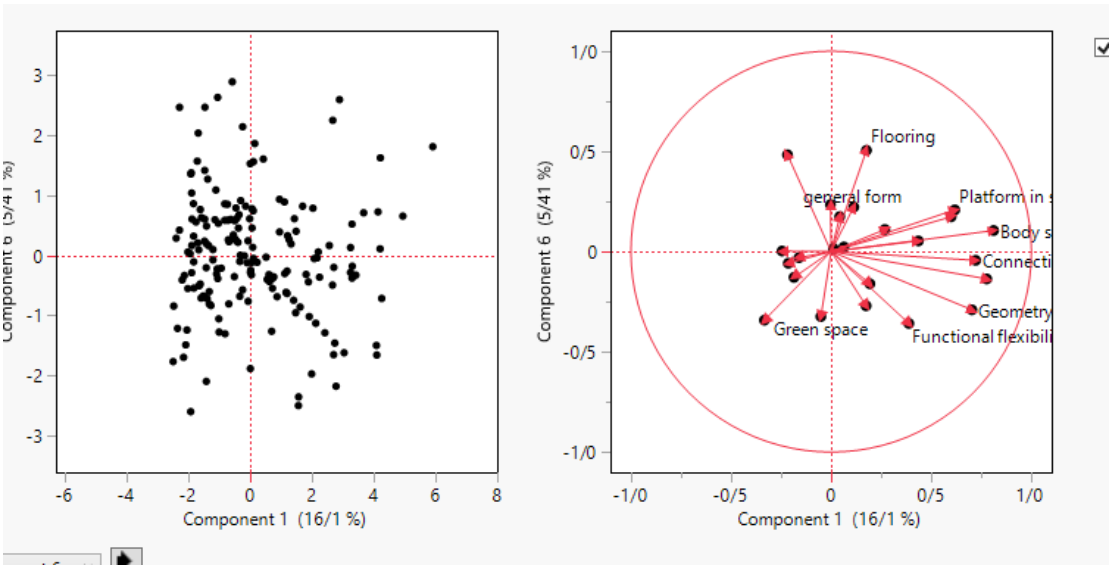


Fig 6 PN modeling of the author of body-behavior in the traditional market complex of Kerman city

The relationship between open and closed space, shades, coming forward and progressing, inviting elements, wall material, platform in space, adjacent to the body of the market, general form, disconnection and connection with the outside environment, color, physical responsiveness in the field of social values, Color is approximately 41% of the influence in the formation of traditional markets in Kerman. Also, these factors are continuous with each other and have an active and interactive function towards each other and should be used collectively. In the next group, organizational coverage rate, use of longitudinal body form, body support for activity, and floor construction in one group have an effect of 29% in the formation of the traditional market of Kerman City. The proper collection of aquifers, physical structure in the mass of space, the height of the walls, and the physical orientation of the whole building are about 17% and the rest of the components are approximately 13% effective in the formation of the traditional market of Kerman.

6. Discussion

Based on the findings of this research, it is clear that the results of descriptive and inferential statistics have discrepancies and the results of inferential statistics should be followed. However according to the data distribution of body-behavior components following the moving average, the tool has been able to measure the issue correctly.

The number of 33 extracted codes refers to the accuracy in theoretical saturation and also the emphasis of experts to extract components indicates their emphasis on visual guide elements to induce the type of activity or to support a specific function in the space, and in their opinion, the behavior according to the body and Their form is formed in the form of mental schemas of users. In descriptive statistics, paying attention to functional flexibility by users allows them to experience different applications such as standing still or moving at the same time in space, and creates potential properties for them, as well as enabling them to He created a trade and place of residence for them for peddlers.

The regression model indicates that the general form of the market, as well as the type of activity, is an emphasis on the internal physical form and internal volumes along with decorations to support movement stillness and sequence in space. The flexibility of the space with respect to multiple functions increases the variety of behavior in the space and gives multiple usability to users for functional efficiency. Based on the results of explaining the physical role of flooring, due to the presence of walls, does not play a significant role in supporting the rafters in the space. PN modeling as a new approach shows the use of identical components in the direction of greater efficiency in supporting behavioral activities. In this research, it is determined that physical and appearance characteristics in the space and how they are used in various components. It can increase and support in space.

7. Conclusion

The native architecture of Iran has an ancient history. In every corner of it, buildings with different architectures can be seen, which at the same time have something in common, this feature has made them necessary to check, and one of them is the market, which still gives its users the ability to use it with its many years old body. Behavior patterns can be recognized based on physical components or supporting components of both dimensions (behavior-body) in luxurious and lasting buildings with continuous efficiency. Because the patterns themselves have emerged in the form of a consistent order in the context of the market environment based on physical aspects, and with their help, we can pay special attention to the development of newly built environments

based on them. These components in their main form include all the forces from the effective environment (natural and human) that lead to the emergence of the physical environment, therefore, their effects in the built environment should be investigated and understood in their exact meaning.

This research shows that the physical aspects inside the spaces can continuously lead to the smell and functional durability of work. Based on that, there is hope that the simultaneous functioning of the components can cause significant growth of the developed buildings of markets such as arcades. In order to achieve human-made environments in commercial centers and arcades, the following strategies are suggested for the use of components:

- Using spaces with diverse bodies and inducing movement by using the difference in the width of the passage to induce stillness and movement and create spatial diversity.
- The use of transparent and flexible spaces to support multiple activities in the space, as well as pay attention to the functional overlap in the physical distribution of commercial spaces.
- Paying attention to the general form in accordance with the commercial functions and integration with the climate in the overall volume of commercial buildings and paying attention to the general form of the interior spaces for accountability in the field of social institutions.
- The use of physical guiding elements for the connection between open and closed spaces in commercial spaces and the efficiency of the continuous body with furniture for multiple body continuity and deeper perception by space users.

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Conceptual Analysis of "Architectural Space's Sacredness" from the Quran and Islamic Wisdom Viewpoint (Case Study: Contemporary Religious Philosophers)

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Research Article

Abstract

"Sacredness/sanctity" means purity and "sacred" means a clean place which is associated with purity. There is no religion that is free from such central concepts and no religion is worthy of being called so without incorporating such concepts and meanings. Hence, the use of the terms sacred or sacredness is an important and valuable action. The main focus of this study is to explore the concept of sacredness in Quran and Islamic wisdom based on the relevant concepts and theories and through this analysis it seeks to explain the sacredness for the realization of sacred place. With such a foundation, the theoretical and practical meaning of sacred architecture can be understood and established.

This study is theoretical research that employs a descriptive method. The data are collected through library references or by referring to books and articles.

The results show that the use of space, human functions, a specific event, or the divine ontological will can destroy or create sacredness of place. Typically, physical form determines the way a space may be used. But this does not mean that physical form is the only determining factor. Intentions, motivations, and actions taken by people are also effective in this regard. The authors believe that sacredness of a place can be considered as an innate and adaptive concept. But depending on the type of formation, it receives varying degrees of sacredness. This means that sacredness may be created the divine ontological will or the human legislative will.

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1. Introduction

A “symbol” in general sense refers to something that is representative of something else and can help us to understand the original concepts or create some mental associations with it. Symbols typically include everything that is used in the communication process between humans, such as images, words, and signs, and meanings are transmitted through these symbol-based communications (Moeini Alamdari, 2001).

“Mysticism” is a science that emerged and evolved in the context of Islamic culture. Muslim mystics have provided many definitions of mysticism and Sufism. Mysticism is defined as the knowledge of God Almighty regarding his names, attributes, and manifestations, and also the knowledge of the origin of the universe and resurrection and the truths of the universe and how these truths are returned to a single truth which is the unified essence of God Almighty. It also refers to the knowledge of the path of conduct ad endeavor in the way of religion for the liberation of the soul from the impasse of particularism and joining his own origin and connecting to the attribute of universality and generality (Qaysari, 751 AH: 7).

“Sacredness/sanctity” means purity and "sacred" means the righteous and competent. Similarly, "sacred" means a clean place which is associated with purity (Rahbarnia et al, 2006: 102). In fact, the interpretation of sanctity and sacredness is applicable entering the realm of ethics. But, the term itself is not derived from ethics and is not specific to the field of religion. There is no religion that is free from such central concepts and no religion is worthy of being called so without incorporating such concepts and meanings. In the Bible, the term sacred is associated with the Hebrew word of Qadosh which is equivalent to the Greek word of Ayios and the Latin word of Sanctus and its more accurate equivalent is sacra. All these words have a meaning beyond goodness and translating them into "rationalization" or "moralization" is mistranslation. Also, Kant’s interpretation of a will which obeys ethical laws based on moral obligations and a commitment does not provide the comprehensive meaning of this concept. Hence, the use of the word holy or sacred is an important and valuable action. Rudolf Otto recommends the word numinous which is derived from the Greek word Numen (Otto, 2001: 47-48).

The term "holy science" refers to a metaphysical interpretation, in other words, to traditional science, which are the application of metaphysical principles in the natural world. If these sciences are separated from their own metaphysical context, they are misleading, but the great attention in the modern age to these sciences implies the great need for them. Traditional sciences must be restored in the new era. The evidence in support for the possibility of the religious and sacred science is the existence of traditional sciences that were fostered in traditional civilizations. Although these sciences were completely different from religion and philosophy, there was a close relationship between them and religion and philosophy. The look of these sciences to the nature differs from the look of new sciences, and the traditional sciences because of their inner and symbolic insights reveal the unseen and obscure aspect of the nature, a feature which has been forgotten in the new era (Nasr, 1999: 176).

“Place” and its position in Islamic art and architecture have been always subject to different discussions by Islamic philosophy thinkers and scholars. The interpretation provided about spatial identity is effective in the formation of location and desirable Islamic architecture and paves the way for recognition, analysis, and valuation (Wathiq et al, 2009: 93-94).

"Traditional knowledge" has a close relationship with the sacred knowledge. In a system of perceptions, the form is equivalent to the truth in the system of rationality because of its qualitative value, and this is what implied by Greek concept of eidos. According to Coomara Sawamy, the existence of a mystery is the same of the existence of what is suggested by that mystery, and that's why the traditional mysticism is never free of beauty, as according to the spiritual insight of the universe, the beauty of a matter is the same as the transparency of its existential and material layers. Real art is beautiful because it is real.

The power of tradition is the creator of the style of the traditional civilization. This style, which cannot be mimicked from the outside, is established and becomes stable without the need for maling any effort thanks to its own spiritual power. One of the essential conditions for happiness is to know that whatever we do entails an eternal sense (Burckhardt, 1993: 83-82).

The interpretation of H. Corbin of "phenomenology" as the unveiling of the inner meaning of the truth (the interpretation that favored by Islamic sources) and some of the earlier works of Mircea Eliade are close to the traditional perspective, while there are a number of Scandinavian scholars of religion who call themselves phenomenologist but whose perspective is, the least, very far from the traditional perspective with its concern for the reality of revelation and the particular universe that each revelation brings into being (Nasr, 1989: 262).

In the book "Knowledge and Spirituality", the sacred matter, knowledge, and sanctity have been studied in detail (Nasr, 1989). In the paper "The position of identity in the mental image of Iranian Islamic city" (Nasr, 2013), the components affecting the perspective of Iranian Islamic cities as well as spiritual and epistemic components affecting the construction of such cities have been discussed.

In the paper on "Norms related to holy places and times in three holy books" (Mohsenian Rad et al, 2011), sacredness and sanctity are seen as an interpretive and valuable category in the realm of religion. The purpose of this paper was to evaluate the normative statements about holy places and times in three holy books of Quran, Torah, and Bible and to determine their similarities and differences through deep content analysis (as a quantitative-qualitative mixed method). Finally, the authors calculated and plotted the symmetry model of the five themes of place and time contained in the three holy books. Also in the paper entitled "Reinterpretation of concepts and properties of sacred architecture" (Sadeghi et al, 2010), the authors believe that the culmination of flourishing and the growth the Iranian art is manifested in sacred field of Islamic art; an art that made it possible for the transition of human being from the material life to the spiritual world by relying on spirituality as the only identity maker element for human. Therefore, using a descriptive-analytical method, the present study tries to recognize concepts and themes related to sacred architecture.

The main focus of this study is to explore the concept of the sanctity in Quran and the Islamic wisdom by considering the relevant concepts and theories in this context.

1.1. Research Questions

The questions addressed in this study are as follows:

What is the meaning of the word sacredness/sanctity?

Among the concepts related to "sacredness", which one be studied theoretically and practically for objectifying and creating the sacred space?

Does sacredness have an intrinsic or acquired manifestation at time and place?

1.2. Research Hypotheses

It seems that it is possible to explain a sound concept of sacredness by exploring the relevant theories based on the Quran verses and the Islamic wisdom. It seems that the manifestation of sacredness in the architectural space is adaptive and the divine ontological will and human actions play a role in creating and forming the place.

1.3. Research Objectives

The aim of this study to explore the concepts related to sacredness in the Quran verses and interpretations based a comparison with the Islamic wisdom and scholars' opinions and provide a sound concept for objectifying and creating the sacred place.

With such as foundation, it is possible to provide a theoretical and practical concept of sacred space.

2. Theoretical Framework

2.1. Sanctity

From the perspective of sociology, a sacred thing is the one that evokes awe and reverence among those who are believers of a certain set of religious beliefs (Giddens, 1989: 748).These sacred objects have such a reputation that the primary man does not touch them with the same negligence he handle his ax, but he they have such a supernatural force that can be a source of good or evil (Noss, 2003: 15). Emile Durkheim defines religion in terms of the distinction between what is holy and unholy. In religion, things that possess divine attributes and qualities are sacred. They represent the values that are essentially important for a group or community. The reverence that people give to sacred things is due to the respect that they give to fundamental social values. Durkheim tries to prove that all religions involve regular ceremonial and ritual ceremonies in which a group of believers comes together to perform them; (Figure 1). In ritual ceremonies, the sense of solidarity and belonging to the group is reinforced. Rituals turn people from the matters related to an unholy community and enter it to a sublime territory in which the group members feel they are associated with transcendental forces (Giddens, 1998: 493).

Fig 1 Kaaba, a church, and a synagogue

2.2. Scientia Sacra

Scientia sacra is nothing but the sacred knowledge which lies at the heart of every revelation and its center is a circle which encompasses and defines tradition. The first question that comes to mind is how the attainment of such knowledge is possible. The answer of tradition is that the mutual sources of this knowledge are revelation and intellection or intellectual intuition which requires the illumination of the heart and the mind of man and the presence of an immediate and direct

knowledge which has been experienced by him. Sapience is a faculty which has been refered to as "presential knowledge" by the Islamic tradition.

Man is able to know things and this knowledge corresponds to some aspect of reality. Ultimately, knowledge means knowledge of "Absolute Reality" and the intellectual power possesses this miraculous gift of being able to understand what existant is and what possess the existence (Nasr, 1989: 119).

Scientia sacra is not the product of thinking or human intellectual power about the content of an relevation or a spiritual experience which itself is not of an intellectual character. Rather, what is received through relevation is itself of an intellectual nature; that is sacred knowledge.

Wisdom is a tool to achieve the sacred essence and sacred wisdom still is the better way to solidarity with that right in which, wisdom, existence, and ecstasy are united. Potential wisdom is the superior way to achieve the sacred nature; (Figure 2).

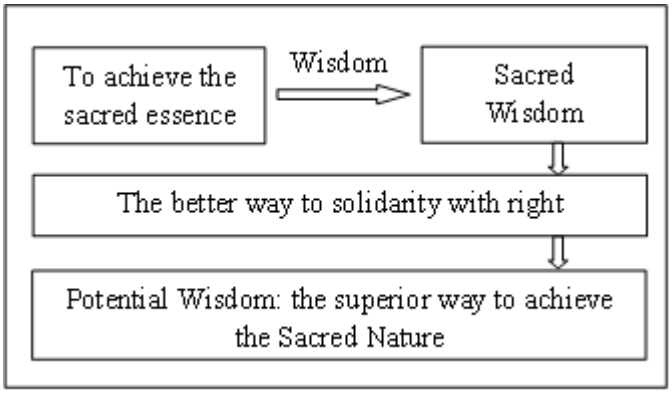


Fig 2 Sacred Wisdom (Source: authors)

2.3. Sacred Space

Sacred space is a place in where, the relationship between our world and the other world, the lower and upper world, macrocosm and microcosm is possible. In other words, passing from a stage to another stage and in particular, from the earth to the sky in the first instance is possible only in the sacred space of the temple. This means the transition from a particular existing quality to another existing quality, the transition from the mundane situation to the sacred situation. In fact, the purpose of sacred architecture is creating sacred and spiritual spaces (Sattari, 2002, 179-180).In sacred architecture, the space finds a qualitative aspect by metaphoric and symbolic statements. Indeed, a sacred center polarizes (not giving sacredness) its surrounding space, just like Mecca (that in the Muslim's opinion it is a point on an axis that joins the earth and sky to each other and on this basis, it itself is the center of the earth) that polarize all the spaces to perform the highest Islamic rule (Ardalan et al, 2001: Prelude L).

In fact, the space of a temple whether small and glorious essentially is a sacred space that a common, limitless and relatively unknown space surrounded it. The surrounding area is an abyss space and because it is unorganized and not well known, its range and structure are not specified and known. Common space is clearly in conflict with the sacred space; because the sacred space has a well-structured range which is called centered and focused (Ardalan et al, 2001: 177). But, it is not the temple that gives sacred to a space, because the temple's space is only a tool or possibility for praying and it cannot give sacred to a work. But also, it should have a sacred concept that is located along and between the other concepts. That a space is sacred is not a reason to say that

everything around it is sacred, but also, its sacredness is because of its implied concept. As the expression of the sanctity of the holy Ka'bah space means a superior presence in that place (Rahbarnia et al, 2006: 105).

2.4. Sacred Sites

Sacred sites are one that encompasses ideological elements of a certain society and possesses high ecological and natural values. Most sacred sites protected by its inhabitants are those that contain one or more ideological elements of that society. These sites consist of sacred natural and man-made elements.

In his article about sacredness, Cairns write: “The serious relationship between man and land based on the belief in the sacredness of the land that surrounds he man needs to be compiled so that its stability is guaranteed. He also points out that such relationship not only protects the environment but also contributes to the reconstruction of the damaged natural regions (Cairns, 2002). Sacred sites have perhaps been the oldest method for protecting settlements on the earth, and there is currently an extensive but unknown network of sacred things around the world. Some scholars believe that there are a great number of sites that are protect based on sacredness (WWF, 2005).

There are also many sites in Iran that are protected based on ideological principles and the culture of local communities. Sacred trees and waters and physical elements such as mountains that have been sanctified have been considered by Iranians for many years through in various cultures and religions. Giving sanctity to natural elements as a context in which human is born, lives, and dies is an unconscious and inevitable matter that sometimes has external manifestations (Irani Behbahani et al., 2011: 162-169). A mystic architect tries by constructing a mosque and gives tidings and warnings to people by inscription some Quranic verses on its entrances, walls, and altar. He does not invite people to worship God using an ordinary language but he attracts people to God by using a symbolic language (Anagheh et al, 2012: 166). It is clear that the ultimate manifestation of the sacred architecture in the realm of Muslim is displayed in physical and semantic structure of mosques which represents the harmony, balance, order and visualization of the Unity of God; (Figure 3).

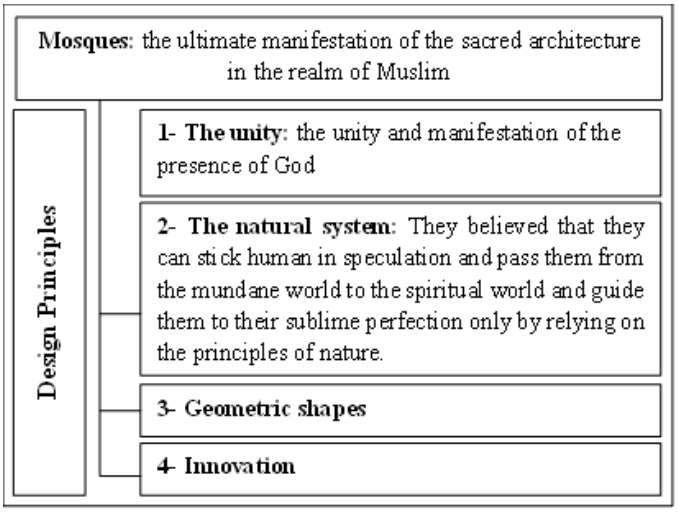


Fig 3 Mosques: Manifestation of Sacred Architecture (Source: authors)

3. The Term Sanctity in the Verses of the Holy Quran

The term sanctity and similar words have been used 10 times in the Holy Quran on the whole; three times for the Holy Land, four times for the Holy Spirit, and three times for God Almighty; (Table 1). The use of the word sanctity for the Holy Land is related to the scope of this study, as will be discussed in the following sections.

Table 1 The study of the term sanctity in the verses of the Holy Quran (Source: authors)

	Quran verse	
Holy Land	His Lord called to him in the Sacred Valley of Towa. (The holy Quran, Chapter 79: AN-NAZIAT (THOSE WHO DRAG FORTH), verse 16)	إِذْ نَادَاهُ رَبُّهُ بِالْوَادِ الْمُقَدَّسِ طُوًى (سوره ۷۹ :النازعات ۱۶)
	I am your Lord. Take off your shoes, for you are in Towa, the sacred valley. (The holy Quran, Chapter 20: TA-HA (TA-HA), verse 12)	إِنِّي أَنَا رَبُّكَ فَاخْلَعْ نَعْلَيْكَ إِنَّكَ بِالْوَادِ الْمُقَدَّسِ طُوًى (سوره ۲۰: طه، ۱۲)
	Enter, my people, the Holy Land which Allah has written for you. Do not turn back in your footsteps, lest you shall turn to be losers. (The holy Quran, Chapter 5: AL-MAEDA (THE TABLE), verse 21)	يَا قَوْمِ ادْخُلُوا الْأَرْضَ الْمُقَدَّسَةَ الَّتِي كَتَبَ اللَّهُ لَكُمْ وَلَا تَرْتَدُّوا عَلَى أَدْبَارِكُمْ فَتَنْقَلِبُوا خَاسِرِينَ (سوره ۵: المائدة , آیه ۲۱)
The Holy Spirit	Of these Messengers, We have preferred some above others. To some Allah spoke; and some He raised in rank. We gave (Prophet) Jesus, the son of Mary, clear signs and strengthened him with the Spirit of Purity (Gabriel). Had Allah willed, those who succeeded them would not have fought against one another after the clear verses came to them. But they differed among themselves; some believed, and others disbelieved. Yet had Allah willed, they would not have fought against one another. Allah does whatever He will. (The holy Quran, Chapter 2: AL-BAQARA (THE COW), verse 253)	تِلْكَ الرُّسُلُ فَضَّلْنَا بَعْضَهُمْ عَلَى بَعْضٍ مِنْهُمْ مَنْ كَلَّمَ اللَّهُ وَرَفَعَ بَعْضَهُمْ دَرَجَاتٍ وَآتَيْنَا عِيسَى ابْنَ مَرْيَمَ الْبَيِّنَاتِ وَأَيَّدْنَاهُ بِرُوحِ الْقُدُسِ (سوره ۲ :البقرة , آیه ۲۵۳)
	Say: 'The Holy Spirit (Gabriel) brought it down from your Lord in truth to confirm those who believe, and to give guidance and glad tidings to those who surrender. (The holy Quran, Chapter 16: AN-NAHL (THE BEE), verse 102)	قُلْ نَزَّلَهُ رُوحُ الْقُدُسِ مِنْ رَبِّكَ بِالْحَقِّ لِيُثَبِّتَ الَّذِينَ آمَنُوا وَهُدًى وَبُشْرَى لِلْمُسْلِمِينَ (سوره ۱۶ :النحل، ۱۰۲)
	When Allah said: '(Prophet) Jesus, son of Mary, remember the favor upon you and on your mother; how I strengthened you with the Holy Spirit (Gabriel), to speak to people in your cradle and of age (when he descends and dies); how I taught you the Book and Wisdom, the Torah and the Gospel; and how, by My permission, you fashioned from clay the likeness of a bird, and breathed into it so that, by My permission, it became a living bird. How, by My permission, you healed the blind man and the leper, and by My permission you brought the dead forth; and how I protected you from the Children of Israel when you brought them clear signs; whereupon the unbelievers among them said: "This is nothing but plain magic". (The holy Quran, Chapter 5: AL-MAEDA (THE TABLE), verse 110)	إِذْ قَالَ اللَّهُ يَا عِيسَى ابْنَ مَرْيَمَ اذْكُرْ نِعْمَتِي عَلَيْكَ وَعَلَى وَالِدَتِكَ إِذْ أَيَّدْتُكَ بِرُوحِ الْقُدُسِ تُكَلِّمُ النَّاسَ فِي الْمَهْدِ وَكَهْلًا وَإِذْ عَلَّمْتُكَ الْكِتَابَ وَالْحِكْمَةَ وَالتَّوْرَاةَ وَالْإِنْجِيلَ وَإِذْ تَخْلُقُ مِنَ الطِّينِ كَهَيْئَةِ الطَّيْرِ بِإِذْنِي فَتَنْفُخُ فِيهَا فَتَكُونُ طَيْرًا بِإِذْنِي وَتُبْرِئُ الْأَكْمَهَ وَالْأَبْرَصَ بِإِذْنِي وَإِذْ تُخْرِجُ الْمَوْتَى بِإِذْنِي وَإِذْ كَفَفْتُ بَنِي إِسْرَائِيلَ عَنْكَ إِذْ جِئْتَهُمْ بِالْبَيِّنَاتِ فَقَالَ الَّذِينَ كَفَرُوا مِنْهُمْ إِنْ هَذَا إِلَّا سِحْرٌ مُبِينٌ (سوره ۵ :المائدة، ۱۱۰)
	To Moses We gave the Book and after him We sent other Messengers. We gave (Prophet) Jesus, the son of Mary, veritable signs, and supported him with the Spirit of Purity (Gabriel). Will you then become proud whenever any Messenger comes to you with that which does not suit your fancies, and you belied some (Prophet Jesus) and killed others! (The holy Quran, Chapter 2: AL-BAQARA	وَلَقَدْ آتَيْنَا مُوسَى الْكِتَابَ وَقَفَّيْنَا مِنْ بَعْدِهِ بِالرُّسُلِ وَآتَيْنَا عِيسَى ابْنَ مَرْيَمَ الْبَيِّنَاتِ وَأَيَّدْنَاهُ بِرُوحِ الْقُدُسِ أَفَكُلَّمَا جَاءَكُمْ رَسُولٌ بِمَا لَا تَهْوَى أَنْفُسُكُمُ اسْتَكْبَرْتُمْ فَفَرِيقًا كَذَّبْتُمْ وَفَرِيقًا تَقْتُلُونَ (سوره ۲:

	(THE COW), verse 87)	البقرة، ۸۷)
Sacrament	He is Allah; there is no god except Him. He is the King, the Pure, the Peace, the Confirmer, the Watchful, the Almighty, the Compeller, and the Sublime. Exalted is Allah, above all that they associate! (The holy Quran, Chapter 59: AL-HASHR (EXILE), verse 23)	هُوَ اللَّهُ الَّذِی لَا إِلَهَ إِلَّا هُوَ الْمَلِکُ الْقُدُّوسُ السَّلَامُ الْمُؤْمِنُ الْمُهَیْمِنُ الْعَزِیزُ الْجَبَّارُ الْمُتَکَبِّرُ سُبْحَانَ اللَّهِ عَمَّا یُشْرِکُونَ (سوره۵۹ : الحشر، ۲۳)
	All that is in heavens and earth exalt Allah, the King, the Pure, the Almighty, and the Wise. (The holy Quran, Chapter 62: AL-JUMUA (THE CONGREGATION), verse 1)	یُسَبِّحُ لِلَّهِ مَا فِی السَّمَاوَاتِ وَمَا فِی الْأَرْضِ الْمَلِکِ الْقُدُّوسِ الْعَزِیزِ الْحَکِیمِ (سوره : الجمعة ۶۲، آیه ۱)
	When your Lord said to the angels: 'I am placing on the earth a caliph, ' they replied: 'Will You put there who corrupts and sheds blood, when we exalt Your praises and sanctify You? ‘He said: 'I know what you do not know. ' (The holy Quran, Chapter 2: AL-BAQARA (THE COW), verse 30)	وَإِذْ قَالَ رَبُّکَ لِلْمَلَائِکَةِ إِنِّی جَاعِلٌ فِی الْأَرْضِ خَلِیفَةً قَالُوا أَتَجْعَلُ فِیهَا مَنْ یُفْسِدُ فِیهَا وَیَسْفِکُ الدِّمَاءَ وَنَحْنُ نُسَبِّحُ بِحَمْدِکَ وَنُقَدِّسُ لَکَ قَالَ إِنِّی أَعْلَمُ مَا لَا تَعْلَمُونَ (سوره ۲: آیه ۳۰)

4. The Holy Land in Quran

The Holy Land or Palestine is the utopia of the people of Israel, and according to the teachings of the Holy Quran, it has been described by Moses (AS) as a utopia for the people of Israel so that they would migrate from Egypt as the land of immorality, slavery, enslavement and captivity to a land that is the center of freedom and independence, the rising place of the great divine prophets and the place of fulfillment of God's will for the advent of the monotheistic community through a transcendent movement. According to the Torah teachings, this land has been introduced as the ultimate destination for the transcendental movement of the people of Israel.

The characteristics of the Holy Land have been mentioned in several directions in the Qur'an (Table 2), including the geographical area, blessedness, and its magnificent influence in human history, the efforts of Prophet Moses (PBUH) to enter this land and confirm the divine goodness in this land (Nemati Pir Ali, 2010: 140).

Table 2 Study of the Holy Land in the Holy Qur'an (Source: author)

	Quran verse	
Geographical area	Exalted is He who carried His worshiper (Prophet Muhammad) to travel in the night from the Sacred Mosque to the Furthest Mosque which We have blessed around it so that We might show him some of Our signs. He is the Hearer, the Seer (The holy Quran, Chapter 17: AL-ISRA (ISRA'), verse 1)	سُبْحَانَ الَّذِی أَسْرَی بِعَبْدِهِ لَیْلًا مِنَ الْمَسْجِدِ الْحَرَامِ إِلَی الْمَسْجِدِ الْأَقْصَی الَّذِی بَارَکْنَا حَوْلَهُ لِنُرِیَهُ مِنْ آیَاتِنَا إِنَّهُ هُوَ السَّمِیعُ الْبَصِیرُ (سوره۱۷: اسراء، ۱)
Blessedness	We gave the persecuted nation dominion over the eastern and western lands which We had blessed. So the Word of your Lord, the finest, was fulfilled for the Children of Israel because of their patience; and We destroyed the edifices, and towers of Pharaoh and whatsoever they manufactured (The holy Quran, Chapter 7: AL-ARAF (THE HEIGHTS), verse 137)	وَأَوْرَثْنَا الْقَوْمَ الَّذِینَ کَانُوا یُسْتَضْعَفُونَ مَشَارِقَ الْأَرْضِ وَمَغَارِبَهَا الَّتِی بَارَکْنَا فِیهَا وَتَمَّتْ کَلِمَتُ رَبِّکَ الْحُسْنَی عَلَی بَنِی إِسْرَائِیلَ بِمَا صَبَرُوا وَدَمَّرْنَا مَا کَانَ یَصْنَعُ فِرْعَوْنُ وَقَوْمُهُ وَمَا کَانُوا یَعْرِشُونَ (سوره۷: اعراف،۱۳۷)

	We sent down blessed water from the sky with which We caused gardens and the grains of harvest to grow (The holy Quran, Chapter 50: QAF (THE LETTER QAF), verse 9)	ونزّلنا مِن السماءِ ماءً مباركاً فَأنبتنا به جنّاتٍ وحبَّ الحصيد (سوره۵۰: ق،۹)
	Had the people of the villages believed and been cautious, we would have opened upon them the blessings from heaven and earth. But they belied, and We seized them for what they earned (The holy Quran, Chapter 7: AL-ARAF (THE HEIGHTS), verse 96)	وَلَوْ أَنَّ أَهْلَ الْقُرَى آمَنُوا وَاتَّقَوْا لَفَتَحْنَا عَلَيْهِمْ بَرَكَاتٍ مِنَ السَّمَاءِ وَالْأَرْضِ وَلَكِنْ كَذَّبُوا فَأَخَذْنَاهُمْ بِمَا كَانُوا يَكْسِبُونَ (سوره۷: اعراف، ۹۶)
The efforts of Prophet Moses (PBUH) to enter the Holy land	(Remember) when Moses said to his people. 'Remember, my people, the favors which Allah has bestowed upon you. He has raised up Prophets among you, made you kings, and given you that which He has not given to any one of the worlds. Enter, my people, the Holy Land which Allah has written for you. Do not turn back in your footsteps, lest you shall turn to be losers (The holy Quran, Chapter 5: AL-MAEDA (THE TABLE), verse 20-21)	وَ إذ قال موسى لِقومه يا قوم اِذكروا نعمه اللهِ عليكم إذ جعَل فيكم انبياءَ و جعلكم ملوكاً وَ آتيكم ما لَم يؤتِ احداً مِن العالمين. يا قوم ادخلوا الأرضَ المقدسه الّتی کتب الله لکم و لا تَرتَدّوا عَلی أدباركم فَتَنقَلِبوا خاسرين (سوره ۵: مائده، ۲۰-۲۱)
Proving the divine grace	We saved him and Lot, and brought them to the land which We had blessed for all the worlds (The holy Quran, Chapter 21: AL-ANBIYA (THE PROPHETS), verse 71)	و نَجَّيناه و لوطاً الی الأرضِ الّتی بارکنا فيها للعالمين (سوره۲۱: انبيا، ۷۱)

A careful look at the Quran verses indicates that the examples related to the term blessedness are not limited to material bounties and, according to the Qur'an's revelations, the Holy Land, or Palestine, is considered as the land of blessing for the enjoyment of the world's blessings, heavenly descents and terrestrial fruits, the rise and dissemination of divine and prophetic movements during the history of mankind (Nemati Pir Ali, 2010, 143).

In fact, verse 71 of Sura Anbia indicates the role of this land in human history. This land is the place of the prophets like Abraham and his elder son, the birthplace of Jesus (PBUH), and the place of his uprising. Also, the temporary Qibla of Muslims was located in this land (Sadeghi Tehrani, 1419 AH) it is therefore called the holy and blessed land.

5. The Concept of Place in Islamic Wisdom

According to the Islamic insights, the world consists of matter, form, and number. Place and time is the container of this content and shape it and make it understandable. Therefore, place is an objective reality in which physical objects find form, action, and movement. But what establishes the religious identity of place is its sacred ground. Sacredness here means the presence of the supreme and the presence of the center of the whole environment. Therefore, the sacred place represents the presence of a supernatural being in the human environment. The world itself is a reflection of an eternal place that is seen in the form of different places. This divine revelation is formed as sacred attributes and essence, and spatial concepts can be recognized through these hypostases. Accordingly, place in Islam is based on the principles of goodness, integrity, and lack of loneliness, which provide the place with features such as centrality, continuity, and divine manifestation. Therefore, place is a space in which divine attributes are embodied.

Manifestation is a multifaceted concept in one sense and thus place is associated with different qualities that enable human being to understand or construct spatial identities while maintaining the

sacred essence of place in terms of human conditions. By this definition, place is the location of divine manifestation and is a microcosm that is linked to the macrocosm and metaphysics. The difference between the concepts of land and the divine dominion and given their identical linguistic root representing the material and immaterial worlds make clear the Islamic orientation toward the concept of place. Land refers to the natural world and the divine dominion implies a subtle and soulful world, both of which represent degrees of presence and place in the divine creation is characterized as a location for the reflection of God in the universe. In the Shi'a prayers, like the Komeil Prayer, this claim is confirmed in a statement implying that "No one can escape from your dominion". The qualitative place is limited by the presence of a sacred entity and its directions and characteristics are not the same. This place can be featured at the special points of the earth, which are related to religious duties and include a wide area from the house of God to the sanctuary and the garden, and in general places are considered as material constructions, whether natural or artificial, as long as their sanctity is respected. In the same vein, the heaven, the earth, and man, as the three divine manifestations possess distinct capacities, and where these beams of being are resulted in creation, the place emerges. An ideal place is also where it unites its constructive elements, and represents the manifestation of profound meaning of the divine reality (Wathiq et al, 2009: 94).

5.1. Sacred Attributes in Spatial Identity:

By preserving identity for all places, Islam values the place on the basis of the divine manifestations of sacred qualities, which in this way places will take different degrees of Islamic identity. Among the most important features of the holy place in Islamic thought are: 1- submission, 2- meaning orientation, 3- centrality and unity, 4- higherarchy, 5- justice and equality, 6- geometry, 7-proportion (Wathiq et al, 2009: 96-96).

6. Holy Place in the Views of Thinkers

There are different opinions about the holy places. The authors of this study have investigated the holy place from the perspective of Rudolf Otto, Mircea Eliade, Seyyed Hossein Nasr and Abdollah Javadi Amoli who are introduced in the following sections. The summary of scholars' views has been expressed in Table 3.

6.1. Rudolf Otto (1869-1937)

Unlike many of his contemporary theologians, this German philosopher and theologian also became interested in non-Christian religions. Otto pointed out that the term "sacred", which should be used in the context of religious meaning, has lost its original and primary meaning, and implies moral and spiritual piety. According to Otto, the original meaning of the word rejects any conceptual perception and mental interpretation. Therefore, he used a new word "numinous" to convey a sense of holiness, void of any moral and rational aspects. The term numinous now implies a certain religious meaning, according to which the holy matter is beyond what is usually understood as a rational and ethical matter.

Otto does not have any reference to the objective aspects in the book of the holy, but also, he emphases on the aspect of subjective perception that was also observed in the discussion of space and place. This mental aspect was the most important characteristics of the place which gave the capability of memorizing to it. He considered the perception of the holy place in achieving certain mental states based on the personal perceptions, while he did not consider the external influences as

the originator factors of these states. The role that he considers for the external influences is maximum a guide or assistance to understand the experience of the holy. In his opinion, this experience comes from the depths of the human soul and external factors can be experienced as a stimulus to achieve this experience. This mental state will occur in two states after this experience: One state is a transient state like experiencing an amazing and scary event that cannot be explained due to uncertainty. But, the next state occurs in deeper and more explicit mode in which, the human receives the presence of a noble and sacred thing and starts revealing it. After revealing the holy in form of place, it continues its presence there and it gives sacredness to that place with its awe presence. By this means local and traditional rituals and ceremonies of worship start there. He named such a residence and seizing by the holy Shekinah, which is based on the translation of the eighth verse of part twenty-six in Mazamir; where it says "the places seized by you are eligible to your greatness." Also, in the twentieth verse of the second chapter in the book of rights the Hebrew word of Shakan is come in the phrase of "the Lord lives in his holy temple that refers the residency and intimidating presence" (Shaghaghi, 2005: 54-55).

This shekhina is the manifestation of God in certain places, where Allah has sanctified them with His presence. Like a blazing bush through which God spoke with Moses or in the holy tent (Ghanbari et al, 2011: 58), in the Jewish Talmudic literature, shekhina means the presence of God in the whole universe and his act, especially among the people of Israel. The presence of God which has been described in the Old Testament as the image of God is nothing but shekhina to the Rabbani (Shari'atmadari, 2010: 97). Table 1 summarizes the similarities and differences in the views of these thinkers about holy place.

6.2. Mircea Eliade (1907-1986)

Another scholar who has addressed the issue of the holy place is Mircea Eliade that his view about on issue is somewhat different from the view of Rudolf Otto. Eliade adopted a new approach to the interpretation and analysis of religious phenomena, and he maintained that religious symbolism was the best manifestation of the creative response that human beings give to the awe and presence in the limitless cosmos. Man is ultimately aligned and co structured with the cosmos (the same harmony between the microcosm and the macrocosm, which is rooted in ancient religious and mystical thoughts), and ancient myths that accounts for forms of eternity or fixed essences, still penetrate into the minds and lives of the new human being. It is worth noting, however, that as part of his attitude, he considers sanctity or sacredness which is the common essence of all the manifestations of religious life and culture as something original, simple, unobtrusive, inseparable into other facts, affairs, elements, experiences, and sciences (Eliade, 1993). In the last decade of his life, Eliade involved in planning and supervising the compilation of the Encyclopedia of Religion in English in 16 volumes and about eight thousand pages containing 2750 articles in collaboration with 1,400 researchers from fifty countries.

Eliade in his book, "The SACRED And The PROFANE", believes that place is not homogeneous for a traditional human and it is not that all places have the same features. He pointed to the example of meeting Moses with God in Mount Sinai and concluded that places are sacred and unsacred and also, the only real place and really existing is the holy place and other places (unholy places) are formed around it. This problem somewhat refers to the polarization of the place by the holy (Eliade, 1963).

He believes in the inherent sacredness of a place and considers the other factors in the revelation of these inherent characteristics. In other words, he thinks that the sacredness of a place is not because of experiencing the holy, but also, he defines a holy place with sacred pleasures and he

considers the experience of the holy only as a sign for a holy place. Although, in this view he clearly approaches a traditional view and surveys the problem with this attitude. Also, he tries to discuss the cosmological place of the holy place as much as possible and observe the issue by a phenomenological look". In other words, Eliade does not know the sacredness of a place limited to the holy, but also he believes that the emergence of a sign is enough to be referred as a holy place. This sign can be displayed by objects and inanimate creatures and with the help of animals. Thus, Eliade concludes that people are not free to choose the holy place. People just look it up and find it with the help of verses (the signs) (Shaghaghi, 2005: 55-59).

6.3. Seyyed Hossein Nasr (1933)

Seyyed Hossein Nasr introduces himself as a follower of the tradition of traditionalism or sophia perenis. Among the characteristics of the new era, the traditionalists emphasize de-religionism, which has led them to support tradition and the struggle against modernity. They regard tradition as a divine principle with a divine origin that is revealed and inspired into the entire cosmic territory. In a broader sense, it can include the principles that make the man subordinate to the divine kingdom and religion, and in a narrower sense, it is considered as the effects of these principles (Nasr, 2004: 57-58). Nasr considers the foundations of his traditionalism to be the "hierarchy of truth", the concept of linear time and separation time (Nasr, 2000: 84), and symbolism. In his view, in traditional realms, religion and mysticism are dominant on various fields of knowledge, including the science of nature, and therefore the sciences were religious.

Of special significance among cosmological symbols which are related to the contemplation of the cosmos as theophany and the experience of the presence of the sacred in the natural order are those connected with space. Space and time along with form, matter or substance, and number determine the condition of human existence and in fact of all existence in this world. Tradition therefore deals with all of them and transforms all of them in order to create that sacred world in which traditional man breathes. Qualitative space is modified by the presence of the sacred itself. Its directions are not the same; its properties are not uniform. While in its empty vastness it symbolizes the Divine All-Possibility and also the Divine Immutability, it is the progenitor of all the geometric forms which are so many projections of the geometric point and so many reflections of the One, each regular geometric form symbolizing a Divine Quality. In all these and numerous other instances what is involved is the application of a traditional science of space which makes possible the actualization of a sacred presence and also the contemplation of an element of the cosmic reality as theophany. It is through this science of qualified space that traditional science and art meet and that cosmological science and experience of the sacred become wed in those places of worship, rites, cites of pilgrimage, and many other elements which are related to the very heart of tradition. This science is closely associated with what has been called “sacred geography” or even “geosophy,” that symbolic science of location and space concerned with the qualitative aspects of points on earth and the association of different terrestrial sites with traditional functions, ranging from the location of sanctuaries, burial sites, and places of worship to places for the erection of gardens, planting of trees, and the like in that special form of sacred art associated with the Japanese garden and the traditional art of the Persian garden with all its variations, ranging from Spanish gardens to the Mogul ones of India. The science of sacred geography ranges from, on the one hand, popular and often folkloric practices of geomancy in China to the most profound sensitivity to the grace of the Divine Presence which manifests itself in certain natural forms and locations on the other (Nasr, 1989: 177-178).

6.4. Abdollah Javadi Amoli (1933)

Ayatollah Javadi Amoli, a philosopher, theologian, mystic and jurisprudent, the teacher of Qom Divinity School, and the Shiite Marja, is one of the prominent contemporary thinkers and commentators of the Qur'an who has a comprehensive knowledge in the Islamic intellectual and transcendental sciences because of his genius and scientific creativity and the use of prominent professors in knowledge and spirituality. The depth of his thoughts, his actions, his ethics, his strength and behavior serve as a model for disciples in the field of science and action. His great familiarity and longing for the Holy Qur'an are evident in his constructive and culture-expanding teachings and guidelines.

According to the following contents, Tour Wadi (Tour Land) and The Land of Mecca which are mentioned in Quran are adventitious and creational issues as the highest level of the holy place and they are not innate. In this case, the lower level of the holy place is adventitious and creational. Tour Wadi: "Allah introduced Tour Wadi as a holy place. Tour Wadi is a symbol of sacredness and glory of God, because it is glorified from idolatry. Since, Tour Wadi is the expression of unity; it is the epitome of beauty and blessing of God... The holy secret of this land is that since, God's invitation is reached and will reach the worlds and goodness will be achieved for societies until resurrection, because, the truth of Mussa's religion is alive today and the Prophet and our divine saints are heirs of Moses Kalim… In the holy Sura of Naml it is said: (so when he came to it a voice was uttered saying: 'blessed be who is (Moses) in the fire and (the angels) who are around it! exaltations to Allah, lord of the worlds!)(The holy Quran, Chapter 27: AL-NAML (THE ANT), verse 8).

Anybody who is in the fire and beside the fire is blessed. However, blessing (around the fire) is not inherently and only blessing (who is in the fire) is inherent that is the emergence of the truth… Thus, the sacredness of that territory is because the fire that was kindled in that land and the sacredness and holiness of that fire is because of the advent of divinity in it and receiving prophecy and revelation. Prophecy and revelation have blessing and the source of this blessing is the Lord of the worlds: (blessed is he in whose hand is the sovereignty) (The holy Quran, Chapter 67: AL-MULK (THE SOVEREIGNTY), verse 1). Therefore, if a territory is cleared of idolatry and unity be appeared in it, it will be sacred and blessed"(Javadi Amoli, 2000: 125-127, V.7). The Land of Mecca: "sacredness of the Prophet Abraham (PBUH) was such that the Islamic communities were assigned to follow his dignity and make his place as the Tawaf prayer. The verse: (so follow the religion of Abraham, the upright) (The holy Quran, Chapter 3: AL-E-IMRAN (THE FAMILY OF 'IMRAN), verse 95) is a clear proof of the necessity to adhere the tradition and religion of that Prophet and the verse (and take ye the station of Abraham as a place of prayer) (The holy Quran, Chapter 2: AL-BAQARA (THE COW), verse 125) is a clear evidence to have commitment in preserving that place and its consecration" (Javadi Amoli, 2000: 365-366, V.6).

Table 3 Holy Place from the perspective of scholar (Source: authors)

Holy place	**Rudolf Otto**	Emphasis on the subjective aspect of the place
		Sacred space perception based no personal reception
		External effects (physical), the maximum guidance and assistance to understand the holy
		After revealing the holy place in the form of place, it continues its presence there and gives sacredness to that place by its awe presence. In other words, personal reception in a place gives it sacredness.
	Mircea Eliade	Referring to the polarization of a place by a holy place

		Trust in the inherent sacredness of a place
		Experience of the holy, merely a sign of a holy place
		People are not free to choose the holy place. They only search and find it through its signs .
	Seyyed Hossein Nasr	The qualitative place has been constrained because of the presence of the sacred essence itself .
		Nevertheless, the extension of the null place is the embodiment of the absolute divine possibility and the absolute divine stability .
		The place itself is the inventor of geometric forms that are multiple extensions of the geometric point and the multiple reflections of the absolute unity.
		Each regular geometric shape is the manifestation of a divine attribute.
	Abdollah Javadi-Amoli	Allah introduced Tour Wadi as a holy and holy place.
		Since, Tour Wadi is glorified from idolatry; it is the symbol of sacredness and glory of God.
		However, blessing (around the fire) is not inherently and only blessing (who is in the fire) is inherent that is the emergence of the truth
		Sacredness of the Prophet Abraham (PBUH) was such that the Islamic communities were assigned to follow his dignity and make his place as the Tawaf prayer.
		Therefore, if a territory be cleared of idolatry and unity be appeared in it, it will be sacred and blessed

7. Findings

7.1. Sacred Place and Time in Mysticism

It becomes clear that the concepts of place and time, or placelessness and timelessness, and their holiness exist in mysticism and all places and times is the manifestation of God in the view of a mystic. Whether these categories are objective such as monastery or subjective such as the heart, it is important to pay attention them. This holiness also manifests itself in other fields, especially religion. Religious places such as mosques and churches, etc. and special occasions for prayers and religious practices are examples of this sanctity and sacredness.

Based on what was mentioned, it can be concluded that the concept of sacred place and time in mysticism has a special place and function such as abandonment of the world, divine intuition, courtesy, return to the eternal and imaginal time and place, the feeling of security and peace, refinement of the soul, perception of presence of God, and demanding wants and needs that are manifested consciously or unconsciously. Blessed mystical places that may be anywhere in the world, such as mountains, deserts, and monasteries have a value beyond the worldly credibility and have their own rituals and customs such as purity, being free from material affairs, physical and spiritual readiness for fulfillment of certain actions. Places in mystical texts sometimes have a subjective and abstract meaning, like the desert of life, whose holiness is manifested in this way. Sacred time in mysticism is such that the mystic dwells in timelessness and beyond the worldly time. The sacredness of time and place, in addition to mysticism, is also evident in other domains such as religion. These times and places each have a sacred reason their establishment and construction, which may be accidental, eventual, inspirational, dreamful, or insinuative (Goodarzi et al., 2017: 242).

7.2. The Holy Land

The Holy Land which refers to Palestine based on the evidence in the Holy Qur'an and the Torah is a fertile land with material blessings, and this is one of the reasons for characterizing it with holiness and blessing. However, according to the Holy Qur'an and the Torah, the main reason for sacredness and sanctity of this land is its effects on the rise and spread of prophetic and divine movements throughout human history. In the verses of the Qur'an, the divine blessings have been given to the people of Israel in order to fulfill the providence of God in pursuit of the line of the previous prophets and the creation of a monotheistic society. This can be clearly explained in the many abundant verses of the Torah. However, because of the emergence and dominance of the idea of racial superiority among the Israelites, the sacredness of the holy land has changed in the schemas of the people of Israel and has degraded to "the settlement place for the superior people of God" (Nemati Pir Ali, 2010: 139).

Based on what was stated, three attitudes are inferred as follows:

The first attitude, which is based on traditionalism, assumes that since the essence of God is a sacred essence, then everything created by him is his manifestation and inevitably sacred. Consequently, there is no unsacred matter in the entire universe, and the distinction between being sacred and unholy loses its justification. From the point of view of the followers of this attitude, human being which has been created by God is a sacred creature. Similarly, what is created by the human mind because it is mediated by the influence of God is sacred. Moreover, every design that a designer as a human being on paper is a sacred design, and any designed space that can be established in the form of a place is a sacred place regardless of the type of its applications and dimensions.

But the second view, which is more based on an interpretive look, considers holiness solely in the essence of God or the origin of creation, but believes that God can provide this sanctity in a completely limited manner to another person or object in the form of manifestation and give it a sacred form. Followers of this attitude about the holy place are divided into two categories:

The first group (Mircea Eliade being a member) considers holy places as the ones that are inherently sacred, and this feature has been in existence since the beginning of creation, and they will preserve it until the end of the world. The only problem that remains is the discovery of these places in various ways, such as the occurrence of various miracles in them and being detected by other beings or other natural and supernatural powers in the form of revelation, inspiration, and dream that occur without the human intervention. For this reason, the intrinsic nature of sacred places (according to this attitude) eliminates the possibility of creating a sacred place, and the designer can only use the known sacred places, then by distinguishing it from the surrounding environment, provide a design appropriate to the culture or religion prevailing in that area for that sacred place.

In contrast to this group, the second group (Rudolf Otto being) does not consider sacred places to a certain time and place, and since they regard holy places as the venue of manifestation of a holy matter, they believe that this manifestation at any moment and in every place can be placed on a person or place and give it a holy form. It may also be transferred from one person or place to another making it unholy (Shaghaghi, 2005: 7). All things, humans, and spaced that are of a nameless quality have reached the realm of immortality. Some of them are unexaggeratedly immortal. They are so strong, balanced, and self-contained that do not simply disappear and are almost immortal. Others only get a moment to that quality, and then return to a lower position where the inner contradictions dominate (Alexander, 2002: 32).

Therefore, this is the existence of that person or place that must create the competency for the manifestation of a holy thing within itself so that the holy thing can belong to it. In other words, this group considers the manifestation of a sacred matter as an acquisitive matter in the sense if a person or place is qualified it will become a recipient of it and if it does not there will be no manifestation. The issue of the possibility of acquiring the manifestation of the holy thing in this attitude, to some extent, allows the designer to create spaces or places, so that they can exhibit the features of the capacity for the holy matter and establish the ability to create sacred places (Shaghaghi, 2005: 8).

In the third view that seems to be supported by the Islamic mysticism, by preserving identity for all places, the place is valued as the basis of the divine manifestation of sacred qualities. Accordingly, in this way, places are assumed to have varying degrees of Islamic identity. The world is a divine manifestation, so the earthy world is under a holy realm. The requirement for occurrence of a sacred identity is not the location of its physical structure, but the spiritual atmosphere of the space makes it ready to accept this concept. The identity of each spatial area is related to the level of its functional relationship with the way the divine bliss-centered orders or the rulings of the Sharia of Islam are executed, and the possibility of the existence of place and, as a result, its identity depends on the divine nature and the true religion. The evilness of a place is defined accordingly, and the place depending on this definition has varying degrees of reality and identity.

In the same vein, heaven, earth, and man as three divine manifestations have capacities for distinction and where these beams of being are turned into creation, the place emerges. An ideal place is also where it unites its constructive elements, and represents the manifestation of profound meaning of the divine reality (Wathiq et al, 2009: 94). Examples are Mount Sinai and Mecca.

God Almight introduced Mount Sinai as a holy and blessed land. Mount Sinai is the manifestation of sanctity and divine glory since it is free from polytheism. Of course, the blessing “from around the fire” is not intrinsic, and the only blessing “from within the fire” which is the emergence of the truth, is intrinsic. In the case of the Land of Mecca, the sanctity of Abraham (PBUH) is so much that the Islamic nation was commissioned to follow his placeness and appointed his place (Ka'bah) as a place of prayers and Tawaf. Therefore, if a land was free from polytheism and monotheism is manifested in it, it would be both holy and blessed (Javadi Amoli, 2000: 127, vol. 7). The intrinsic sanctity of all the acts of God and along with it the sanctity of human actions as the divine caliph is fulfilled provided that the caliph obeys his predecessor (God). Table 4 summarizes the findings of the study.

Table 4 Different attitudes about the identity of Holy Places (Source: authors)

<table>
<tr><td rowspan="10">Identity of Holy Places</td><td>Traditionalism</td><td colspan="2">The intrinsic sacredness of all God’s actions and consequently human’s actions</td></tr>
<tr><td rowspan="7">Interpretative</td><td rowspan="3">Intrinsic</td><td>Limited and specified holy places</td></tr>
<tr><td>The goal is to discover holy places</td></tr>
<tr><td>There is no point in constructing holy places and the designer has to identify them.</td></tr>
<tr><td rowspan="4">Acquisitioned</td><td>Not limited to time and place</td></tr>
<tr><td>A holy place is a manifestation of a sacred matter.</td></tr>
<tr><td>It somewhat enables the designer to create holy places.</td></tr>
<tr><td>External (physical) effects provide the best clues for understanding the sacred matter</td></tr>
<tr><td rowspan="3">Islamic Wisdom</td><td colspan="2">The universe is the divine manifestation. Therefore, the earthy world is controlled by a sacred territory.</td></tr>
<tr><td colspan="2">Places are valued based on the degree of divine manifestations and holy qualities.</td></tr>
<tr><td colspan="2">The identity of each place depends on its functional communication with the Islamic</td></tr>
</table>

		Sharia.
		Accordingly, places have varying degrees of Islamic identity.
		In this vein, the heaven, the earth, and the man as three divine manifestations have capacities for distinctiveness.
		An ideal place is also where it unites its constructive elements, and represents the manifestation of profound meaning of the divine reality.
		Examples include Mount Sinai and the Land of Mecca.
		Mount Sinai as a holy and blessed land as it is the manifestation of sanctity and divine glory and free from polytheism.
		The sanctity of Abraham (PBUH) is so much that the Islamic nation was commissioned to follow his placeness and appointed his place (Ka'bah) as a place for prayers and Tawaf.
		Therefore, if a land was free from polytheism and monotheism is manifested in it, it would be both holy and blessed.

8. Conclusion

At the end, it can be said that there are four different aspects of the word sacred that they cannot be combined: The first aspect is that the holy matter is beyond time and place, which means it is not contractual and is not ordained by human beings, but it has been existed from the first day of the creation of this world. The second aspect is that sacredness is created the divine ontological will or the human legislative will. The third is its ability to be perceived by humans. That is, the man in his spirit, perceptive power, and in his subconscious has the ability to recognize and understand sacred things. Fourth, it refers to the essence of being and the essence of the unique divinity, pointing out that he himself is the creator of this world and has laid down these rules. That's why people have the ability to understand, perceive, and create it. But in the case of the sanctity of the place, there are different opinions that the writers in this study have examined them from different perspectives and have come up with some conclusions about it.

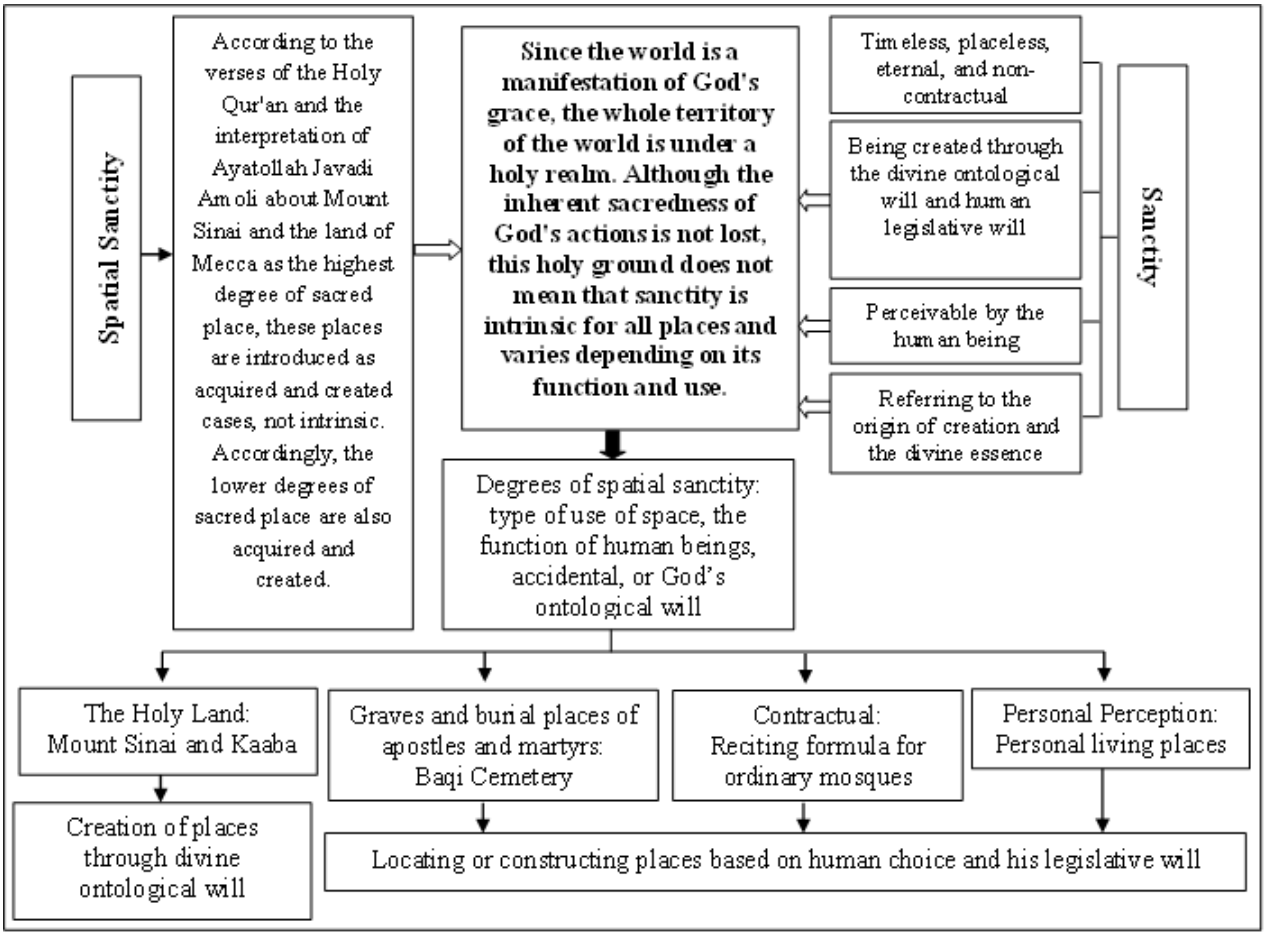
According to the verses of the Holy Qur'an and the interpretation of Ayatollah Javadi Amoli about Mount Sinai and the land of Mecca as the highest degree of sacred place, these places are introduced as acquired and created cases, not intrinsic. Accordingly, the lower degrees of sacred place are also acquired and created. Since the world is a manifestation of God's grace, the whole territory of the world is under a holy realm. Therefore, this holy ground does not mean that sanctity is intrinsic for all places and varies depending on its function and use. With regard to what has been said, the authors believe that the sacredness of the place is an acquiring and creational phenomenon, in the sense the God's ontological will has created it (sending revelation to Moses in Mount Sinai) or by mankind's legislative will (recitation of the mosque formula).

The type of use of space, the function of human beings, certain events, or God's ontological will may obliterate or create the sanctity of the place, and, depending on the nature of the creation, obtain the degree of sanctity. Accordingly, the sacredness degrees of places can be divided into four general categories: (1) Personal perception: personal living space, (2) Contractual: recitation of formula for ordinary mosques, (3) Grave yards and burial places of apostles and martyrs: Baqi Cemetery, (4) the Holy Land: Mount Sinai and Mecca. The first three places have been created based on human choice and his legislative will. The fourth case has come to existence through the divine ontological will.

Typically, physical form supplies the type of performance and utilization of space. But, this does not mean that physical form is the only factor. Intentions, motivations and performance of people are effective in this relation. In discussion of the sense of place, physical form is the most important

and activity and meaning are important. This means that if the body does not exist or is not appropriate, activity and meaning do not form or do not work correctly. On the other hand, if the activity and meaning be assumed at the highest level of desirability, when there is no physical form, it cannot be actualized. The summary of the research results is presented in Figure 4.

Fig 4 Perceiving Sanctity in Time and Place (Source: authors)



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Evaluation of the Existing Geometric Proportions in the Beauty of Historical Bridges of East Azerbaijan from Safavid to Pahlavi

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Research Article

Abstract

The role of proportions in architecture is undeniable throughout history, and the researcher has succeeded in introducing a proportional evaluation system with 11 stages and 9 proportional systems including: basic and multiple modules, proportions The golden rectangle, golden spiral, circles following the ratio of 1:618/1, Platonic rectangle, radical ratios, golden ratio, Le Corbusier's modular system and the proportions of Caen and Shako have been analyzed proportionally. This research has been carried out with the aim of extracting and classifying the existing geometric proportions in the selected bridges from the Safavid to Pahlavi periods, as well as classifying and prioritizing them. The causal-comparative research method and the strategy of answering the comparative question, which are scored based on the relevant observations and based on the observation of the extraction package and the visible items, are then entered into the SIGMAPLOT software to check the factor contribution and present the regression relationship. The linear regression relationship Y=ax+b is presented. The observations are collaborative and with the approach of compiling a balance sheet, and the sampling of bridges is targeted and with entry and exit criteria. The results show that the greatest role in creating the beauty of the selected bridges of East Azerbaijan is the golden ratio with a value of (1.000) and the least is related to Le Corbusier's modular with a value of (0.195).

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1. Introduction

Different views of architecture have existed as long as humans have existed and even before that, which has seen many imaginations. In this process of transformation and smooth evolution, the presence of some metamaterials has made them eternal and divine in the valley of architecture. Since the birth of architecture, geometry has been, is and will be. The knowledge of geometry, like many human sciences, has a long history, which has always been used in architecture to enhance the material and convey the spirit, meaning and special effect. (Saki and Pakzad, 2014). This type of use for creation by mankind can be influenced by the thoughts and ideas of philosophers and great thinkers, as Plato says that God is an "engineer" and before him, Pythagoras and after him Plotinus also believed that mathematics is because of its sensible area (and not Perceptible) has a theological aspect and the principles of God created the world based on an amazing mathematical order based on two right triangles (Ching, 1998).

A bridge is a phenomenon that moves the environment and landscape around it. Building a bridge is a symbolic movement; (Tahbaz, 1988). In addition to removing people's need to travel, it makes it possible to overcome an obstacle. Therefore, the history of the origin of bridges is very important; This history is rooted in the footprints of the first human who tried to cross a calm river. Iran's ancient bridges are also among engineering and artistic masterpieces, in general, in architectural works and technical works, Iranians have never been separated from each other, art and science, but these three have always been hand in hand. given and with the efforts of builders and engineers, he created a work that was rich and new in every respect. (Kozlova, 2016). By observing these rhythmic works, one can understand the way of thinking of Iranians and their relationship (Stevanović, 2013).

He understood its parts with each other and the unity of the elements and considered the material forms as an embodiment of this body of thought, bridge building is an ancient spark and in all the several thousand years that have passed since the formation of human societies on the earth until the industrial revolution of Europe in the 19th century, bridge engineering and architecture have never been separated from each other (Tsigichko, 2007). The architecture of the bridge is a combination of a structure that is affected by the river bed, the strength of the ground and the amount of water passing under it, both in normal times and in floods every few years. In every bridge, four main forces are active in interaction, which are tensile force, compressive force, bending force and shear force. In the ancient world, Iranians, Romans and Chinese were the leaders of other nations in bridge building. Iranians, the reason for living in a wide variety of climates, have been one of the nations that built durable and beautiful bridges. How effective are each type of geometric proportions in the formation of these bridges?

2. Research Background

In this research, in order to avoid procrastination in writing and speech, as well as abbreviated writing in the presentation of the conducted researches, an attempt has been made to categorize the results in the form of Table 1.

Table 1 Research history of Iranian authors

Row	Author/authors	Research title	Publication year	Conclusion
1	Reza Meshkini Asl	Investigation and identification of West Azarbaijan and East Azarbaijan bridges	2001	During the Safavid period, due to the expansion of the road network and a lot of luck towards architecture, bridge building enjoyed significant progress.
2	Amir Shah Karami, Seyyed Abdul Azim	Reading Khaju bridge engineering	2006	Paying attention to engineering aspects in the design of buildings such as Khajo Bridge has changed the perspective and analysis in researches, and modeling obtained from historical examples can show a prominent role in the architecture and development of our country.
3	Naderi Far, Hamid Reza, Ahmadi Barouq, Hamid Reza	Semantic geometry and its crystallization in the structures of Islamic art (with an emphasis on the art of mosque architecture)	2010	It examines the mystical and Quranic meanings of Islam that are manifested in the geometry of mosques.
4	Ansari, Mojtabi, Nejad Ebrahimi, Ahad	The process of intervention in Iran's historical and cultural monuments with a value-oriented policy approach	2010	By studying the geometry and proportions of the building, the decorations and shapes used, the materials and the style based on which the motifs and geometric shapes are placed together, they have come to the conclusion that the proportions examined in addition to the decorations in the building in the structure Its geometry has also been of interest.
5	Mahmoudi, Mahnoush, Chaideh, Ali	The application of mathematics in Iranian architecture (investigating the role of geometric proportions in the entrance decorations of the houses of the old texture of the historical city of Dezful)	2010	Examining the way geometry and architecture are connected in the brick decorations of inscriptions and the effect of brick dimensions in the formation of this connection in the entrance gates of traditional houses in the historical city of Dezful and providing a suitable model for the revival of brickwork and the design of new decorations.
6	Bamanian, Mohammad Reza, Okhovat, Haniyeh, Beqai, Parham.	Application of geometry and proportions in architecture	2010	By examining the concept of geometry and proportions from different perspectives, as well as different historical periods and numerous examples, she has provided solutions in terms of aesthetics.
7	Maysam Mirian	The role of fractals in geometry,	2011	Proving the similarities between Islamic motifs and fractal geometry products in the forms presented in the mentioned article, which can be

		mathematics and its relationship with Islamic motifs in Iranian buildings and mosques		considered as a suitable stimulus for new research areas.
8	Mojtaba Rezazadeh Ardabili, Mojtaba Mojtaba Sabet Fard	Recognizing the application of geometric principles in traditional architecture Case study: Palace of the Sun and its hidden geometry	2012	Realizing the geometric feature of the work and its creative application, along with other characteristics and concepts, can help to revive the authentic Iranian identity in architectural works.
9	Mona Dioj Polly	The role and position of bridge building in Safavid period architecture	2015	The role and place of bridge building in the Safavid era architecture, the importance of building bridges, due to its general utility aspect, is the prosperity and comfort that it provides for the general public; Therefore, the most important factor in bridge construction is the resistance and stability of the building against natural and human destructive factors.
10	Hassan Karimian, Saman Sidi	Geometry and geometric proportions in the construction of domes of Safavid mosques in Isfahan	2018	The results of the investigations indicate that the Safavids paid special attention to proportions in architecture and converted the square design under the dome into a circular dome design. During this period, the geometry became simpler and discrete domes became more popular.
11	Johannes Wallner & Helmut Pottman	Geometric calculations for free form architecture	2011	Geometric computing has recently found a new field of applications, that is, various geometric problems that lie at the heart of the rationalization and design processes informed by the construction of free-form architecture.
12	Maria J. Zychowska	Architecture of bridges	2015	In this article, some bridge structures from the ancient aqueducts to the newest rivers have been investigated. Their main purpose is function and efficiency rather than aesthetic considerations, and yet from a time perspective, they still impress with their beauty and perfection.
13	Prof Nadja Kurtovic Folic	Participation of architects in bridge aesthetics	2015	Introduction Examining the interface between architecture and engineering is a complex issue. The responsibilities of engineers and architects often overlap. Both professions are inseparable in the design and construction of structures such as bridges. Architects design the space to meet the needs of the client as well as the aesthetic appearance. The main responsibility of engineers is to ensure that the design is safe and complies with all appropriate structural codes.

3. Theoretical Foundations

3.1. Fit

Proportion, which in Euclid's view refers to the quantitative comparison of two similar things, has been the basis of the creation of the whole nature, including the heavens and the earth, and especially humans. Proportions have always been used in different periods and ancient civilizations in the design of buildings. Proportion in an object always makes the object look more balanced

(Hejazi, 2005). Proportions have been used in architecture from materials and materials, climatic conditions, technical and executive factors to the thoughts governing people's lives, and space has been designed as a suitable background for human growth and excellence (Akkach, 2005). Proportion is one of the basic principles of an artwork that expresses the harmonious relationship between its components (Ansari et al., 2011: 46). In another definition, proportionality is: the relative and analogical relationship between different parts and the whole of an element. Proportion, while being a determining factor for harmony, is one of the issues that has always been discussed in architecture. Proportion is a subjective value and can only be checked in relation to the shape. Proportion in architecture means a ratio that expresses the relationship between two or more sizes (Grotter, 2004: 360).

Measuring the size of two things produces a ratio. According to Euclid's theory: quantitative comparison refers to two similar things. While proportion is said to be the equality of proportions. Proportions are a set of ratios; a ratio is a comparison of two qualities or quantities such as size or amount (Critchlow, 1989).

Therefore, ratios are considered to represent a unit of a difference or difference. In the field of architecture, proportions include the comparative ratios of various quantities and qualities of heterogeneity, and hence its understanding is more complicated. If we take the fit as an example of the activity of perception based on the recognition of difference (Carrier, 2005: 9).

3.2. Geometry

The word geometry refers to the science of the properties and relationships of quantities such as points, lines, surfaces or volumes in space and the way parts of a particular object fit together (Concise Oxford English Dictionary, 1999). The Arabic word for geometry is the word "size" in Persian. Geometry means size and shape. It is one of the principles of mathematical sciences and it is a science in which the states of quantities and sizes are discussed (Dahkhoda Dictionary). Geometry is a word that Islamic scholar chose against the Greek word "geometry", which consists of two parts "geo" meaning earth and "meter" meaning measurement (Dore and Murphy, 2013). The first confirmed record of geometrical knowledge and its relationship with astronomy, man and music dates back to ancient Greece, especially, to the time of Pythagoras and Plato. Perhaps the Greeks were the first to popularize geometry, although being the first does not mean being the first to discover it (Elam, 2001). Ibn Sina considers geometry to be the science of knowing the position of lines, shapes, surfaces and proportions. In other words, different definitions of geometry all emphasize the relationship between geometry and shapes and proportions (Fletcher, 2019). Therefore, the science of geometry is a powerful tool that has enabled the architect to measure spatial proportions and create balance, order and beauty. Geometry plays an essential role in the design of architectural buildings (Imamoglu, 2000). From the point of view of external performance, the use of geometry as art to create shapes, patterns and proportions recalls the great architect of the universe (God). Therefore, the art of geometry is the key to creating a connection between the building and the ideas that the builder has in his mind. (Josephine, 2017).

Table 2 Definitions of Geometry and Proportion (Hejazi, 2005: 17-44).

Given definitions of geometry and proportion		
Size and shape		Concept
Studying in space and imaginable shapes and objects in this space	Geometry	Mathematics
The proper relationship between the	Proportion	

components with each other and with the whole work		
The proper relationship between the components with each other and with the whole work		Visual Arts
Creating visual beauty, an inseparable part of the architectural space		Architecture

The study of geometry in ancient civilizations indicates that geometry is divided into two practical and theoretical categories:

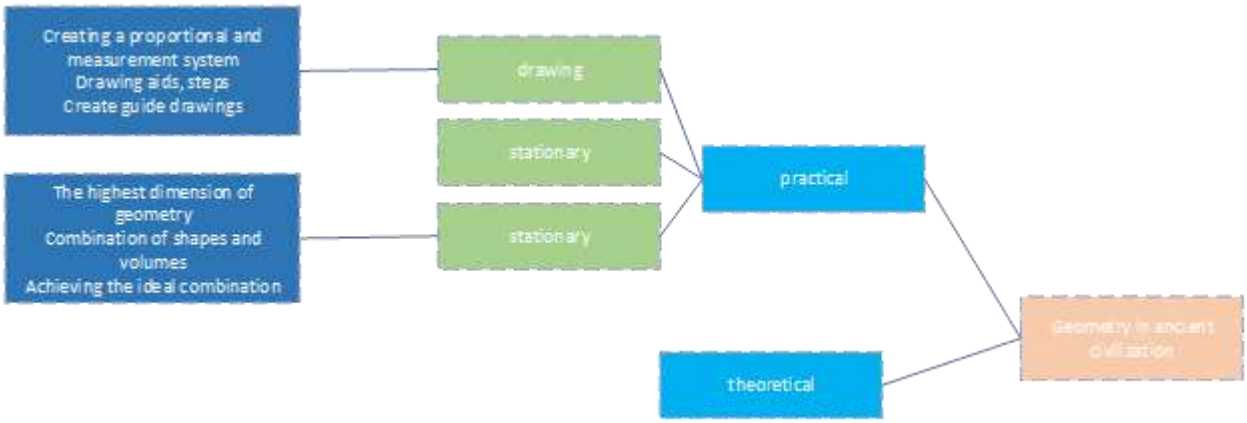


Fig 1 Geometry in ancient civilizations (Ansari et al., 2011: 53).

Geometry is both quantitative and qualitative in nature. Its chemical dimension regulates the order and structure of design forms. Its quality essence determines the dimensions of the design forms and presents the representation of the world order as a visual representation (Zhu, 2012: 1741). Each pattern or geometric shape, when considered from the perspective of its symbolic meaning, displays an echo of unity and a reflection of values and principles within the larger frames beyond unity (universal unity). Seyed Hossein Nasr states that geometry and rhythm represent a single doctrine that is central to Islam, according to which Islamic art is based on mathematical dimensions and shows the dimensions that are the heart of Islam (Elam, 2001).

Geometry is the main design of the creation of all shapes. It is a science that is related to numbers in space with 4 main levels: the first is the science of arithmetic (pure numbers), like any dimension and size, it is a geometric measurement (Imamoglu, 2000: 11). The second level is figures in space, which displays dimensional geometry. They reflect meanings and "ideas". The third level of time figures is the basis of music. The fourth level is the figures in time and space that represent the universal cosmology (Dabbour, 2012).

Dimensional geometry and primitive roots that consider the most beautiful dimensions of beauty are included. Thus, beauty, for Muslim artists, is an objective and self-descriptive truth, the essential nature of beauty, as Plato said, "beauty is the glory of truth"(Akkach, 2005).

3.3. Theories Related to Proportional Systems and Measurement Units

All theories of proportions aim to create a sense of order between the components of a visual composition. The proportional adjustment system creates a set of visual fixed ratios between the components of a building and also between the components and the whole. Proportion regulation

systems go beyond functional and technical determinants of architectural form and space, and present aesthetic arguments about themselves (Kozlova, 2016)

The theories related to systems of proportions and units of measurement can be examined in two ways:

1- Geometry and proportions in Iranian-Islamic thought

2- Geometry and proportions in global thought

3.4. Geometry and Proportions in Iranian-Islamic Thought

Iranian Golden Proportions is the name given by Pirnia engineer to the ratio of the sides of a rectangle enclosed in a regular hexagon, and among the published articles and books, these ratios are considered to be involved in the formation of Iranian proportions (Abolghasemi, 2005). The things mentioned by him are the formation of three doors based on the ratio of the sides of a halved rectangle inside a regular hexagon and also the formation of courtyards based on a complete rectangle surrounded by hexagons. Utilizing the knowledge of geometry and proportion in Iran's architecture has had a special place both before Islam and in the Islamic era (Haji Ghasemi, et al., 2012). With the advent of Islam, since mere imitation of nature did not have a prominent base in Islamic culture, a single and unified view emerged in the combination of abstract art and separated from matter and nature, which saw the world as transcendent and did not follow nature completely (Bamanian, Okhovat, and Baqaei, 2010: 171). The system of Islamic proportions is based on the geometric properties of square, double square, equilateral triangle and pentagon, which are equal to Asam numbers and the world of balanced proportions or Iranian proportions is 1/41=√2 and 1.73=√3 and √5 and (1.118=√1.25 and √5.2) (Stevanović, 2013) which are derived from √2 and √3 are created (Ayat Elahi, 1998).

The use of √2 and √3 ratios in the ancient architecture of Iran, as well as the use of pimon in the architecture of Iran after Islam, indicate the use of the precise system of adjusting proportions in Iranian architecture (Bamanian, Okhovat, and Baqaei, 2010: 175)

√2 represents the geometric shape of a square and the resulting shapes are surface representations, while √3 represents the geometric shape of a triangle and the resulting shapes are volume representations. If we consider a square with a side of one unit and make an arc equal to its diameter with a ruler, the larger side of the obtained rectangle is equal to the diameter of the square, i.e. √2. With the obtained rectangle diameter, you can draw a √3 rectangle, and with a 3√ rectangle diameter, you can draw a √4 rectangle, and this process can continue. Such rectangles are called dynamic rectangles. The √3 rectangle is called a Platonic rectangle that forms an equilateral triangle (Nikghadam, 2012).

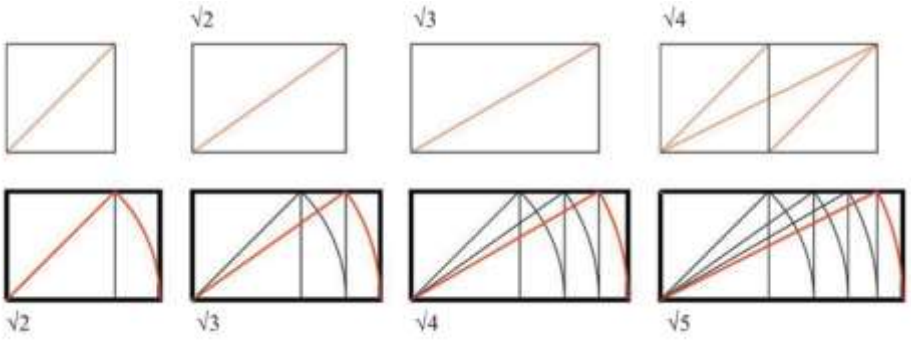


Fig 2 Consecutive structures in proportional rectangles based on square diameter (Source: Stevanović, 2013).

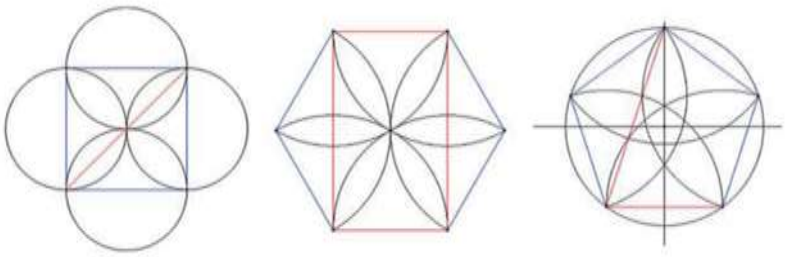


Fig 3 Roots of dimensions √2, √3, √5 (Source: Stevanović, 2013).

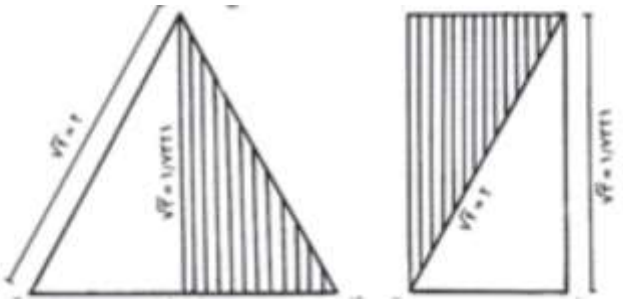


Fig 4 Platonic rectangle (Source: Stevanović, 2013).

3.5. Golden Ratio

The golden ratio (also called the golden ratio, golden mean, divine ratio, divine proportion, sacred ratio, or simply the Φ ratio) is a transcendental ratio found in fundamental forms such as plants, flowers, viruses, DNA, shells, Planets and galaxies are found. √5 is a ratio that paves the way for the principle of ratios called the golden ratio (Stevanović, 2013). The golden ratio is a constant ratio that is derived from a geometrical relation and like the number π and other similar constants in numerical components, it is the "nominal" number. The numerical value of the golden ratio, which is called Φ, is Φ = 1/6180339000 or (√5+1) = Φ (Lawler, 1989: 95). √5 represents the pentagonal geometric shape and the resulting shape is the expression of nature and it is obtained from the combination of 5√ regular shapes of decagonal, icosahedron and the like, which is widely used in Islamic architecture and examples of these proportions and their combinations in Nature is found, among other things, in the proportions of the human body (Tsigichko, 2007).

The golden ratio has unique features:

... (((((. . ./ 1+1) /1+1)/1+1)/1+1)/1+1= Φ

The ratio of the parts in the pentagon and the five vertices (five-pointed star) which were sacred to Plato and Pythagoras. Also, the twelve faces of the Platonic volumes are the twelve faces in the shape of a pentagon, which includes the golden ratio (Hejazi, 2005). For this reason, Plato considered this shape to be equivalent to the universe. in all five vertices, each larger (or smaller) part is related to the ratio T, so that a series of powers of the golden ratio are automatically generated with consecutive ascending (or descending) powers: Φ^4, Φ^5, $^3\Phi$, Φ, Φ^2,

The general rule of Esan's body is also made up of the golden ratio (Haji Ghasemi et al., 2012). Examples of the applications of these proportions in Iranian architecture before Islam are the long middle porch of the Kasri Palace in Tisphon, which followed the √3 ratio, and the Apadana Palace in Persepolis, which followed the √2 ratio. He named in the post-Islam era, the ratio of √2 was used in the Imam Mosque of Isfahan. Sarvestan Palace has golden proportions (Dabbour, 2012). The ratio of 1.118, which is obtained from the golden ratio, was used in pre-Islamic architectural proportions. This proportion can be seen in the length and width of Sarostan Palace and Kasri Palace, which are Sassanid palaces (Fletcher, 2019).

Fig 5 Sarostan Palace, application of proportions 1.118 (length to width ratio) (Source: Fletcher, 2019).

3.6. Geometry and Proportions in Global Thought

Geometry and proportions in global thought can be divided into 4 categories:
a- Golden proportions
b- Renaissance theories
c- Le Corbusier modular
d- Human proportions (Tahbaz, 1998).

a. Golden Proportions

The ancient Egyptians used proportions that they called theological proportions. Later, these proportions were called the divine proportion by Vitruvius, an Italian architect of the second century. But at the end of the 19th century and the beginning of the 20th century, when gold became the standard of economic measurement, these proportions became popular with the term golden proportions (Dabbour, 2012). The law of golden divisions of line segment by Euclid, a prominent Greek philosopher and mathematician, in the third century BC. discovered. Also, after some time, the Greeks realized the dominant role that the golden ratio played in the proportions of the human body (Stevanović, 2013). Therefore, they reflected these proportions in the building of their temples. In this ratio, a line is divided into two unequal parts, where the ratio of the length of the smaller part to the larger part is equal to the ratio of the length of the larger part to the whole line. The golden ratio is the ratio of 1 to 61803.1. (Zychowska, 2015). Whenever a shape or volume has allegorical or acceptable dimensions and sizes, it is called proportional or having golden sizes.

Sublime and golden ratios have become common in every culture according to the beliefs and likes of that culture and thought, and it has proven its beauty due to the multitude of uses (Amir Shah Karami, 2006). Proportions in their general form rely on the science of geometry and mathematics in their place and in their specialized form, they have an undeniable value in the basics of understanding art and are considered as fundamental considerations (Carrier, 2005: 9). √3, √2 and ... and Fibonacci numbers (Carrier, 2005: 71). Architects also used this law during the Renaissance period. Le Corbusier set his modular system based on golden proportions. The golden ratio that has been widely used in Islamic architecture is the ratio obtained from pentagonal dimensions (Ansari, Okhovat, and Taghvaei, 2011: 71).

If three points are on a straight line, the ratio of the large segment to the small segment is equal to the ratio of the length of the entire line segment to the length of the large segment (Vitruvius called this geometric ratio theological ratio in the second century AD). Lahuti ratio: It is a ratio that divides a line segment into two proportional parts so that the ratio of the smaller part to the larger part is equal to the ratio of the larger part to the whole line segment (Abolghasemi, 2005).

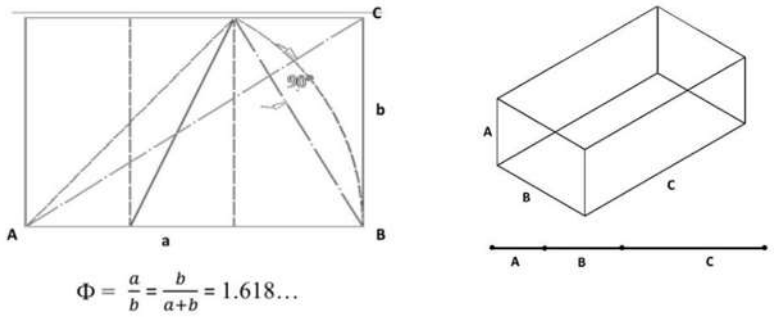


Fig 6 Golden proportions (Source: Ching, 1998: 300)

The golden ratio of the line segment is represented by the 21st letter of the Greek alphabet, T. Phi Dias, a Greek sculptor, studied the golden ratio in detail, and for this reason, this ratio is also known as Phi (Φ) (Kashifpour, 2009). Dividing the line segment into two proportional parts can be used to make: 1) golden rectangle and spiral, 2) golden pentagon, 3) golden triangle.

Golden rectangle and spiral:

In making the golden rectangle, like √2, the index square is used. With the difference that to draw a golden rectangle, Kozlova, N. (2016) we make an arc equal to the diameter of the square from the diameter of half the index square, the obtained point shows the place of formation of the golden rectangle, where the points (c, e, f) are the same as points A, B, C there are golden lines (Kozlova, 2016).

Golden pentagon:

As mentioned earlier, the number √5 represents the pentagonal geometric shape. Now, the regular pentagon enclosed in the circle is the golden pentagon, which forms the golden regular decagon with another pentagon, upside down (Ayat Elahi, 1998). In a pentagon, the diagonals are divided into two proportional parts like the golden section (Bemanian et al., 2011).

Golden Triangle:

As mentioned, the √3 rectangle is called the Platonic rectangle, which forms an equilateral triangle and, in this definition, the isosceles triangle that exists in the golden pentagon drawing is called the golden triangle, which can be divided into two other golden triangles (Wallner and Pottmann, 2011).

Fibonacci sequence:

The mathematics of the golden ratio was found by Leonardo Fibonacci, the founder of the "Fibonacci sequence", a series of numbers found many times in the natural world. This sequence follows the rule that the next number is the sum of the previous two numbers, as follows: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, etc. (Elam, 2001). If we divide any number in the Fibonacci sequence by the number before it, say 144.5 or 89.5, the answer is always close to 1.61803, which is the golden ratio value. The Fibonacci sequence, or characteristic description of the golden ratio, can be seen anywhere in the forms of nature, music, and art. One of the mathematical products is the sacred spiral ratio, which is commonly found in nature (Rawles, 1997).

b. Renaissance Theories

Pythagoras realized that the sound harmony of the Greek music system can be expressed by the following simple expansion 1, 2, 3, and 4 and their ratios as 1:2, 1:3, 2:3, and 3:4. This ratio led the Greeks to believe that they had found the key to the mysterious harmony that pervaded the universe (Hejazi, 2005). Pythagorean believed that everything is arranged according to numbers. Later, Plato completed the science of calculating Pythagorean numbers as the science of proportion. He squared and cubed this simple numerical expansion to obtain double and triple expansion (Hejazi, 2005). According to Plato, these numbers and their ratios not only understood the harmony of sounds in Greek music, but also showed the harmonious structure of the world. Renaissance architects, believing that their buildings should belong to a higher order, referred to the Greek system of mathematical proportions. The Greeks believed that music is geometry translated into sound, Renaissance architects believed that architecture is mathematics translated into spatial units (Mahmoudi and Chaideh, 2010). By applying the Pythagorean theory about the intermediate ratios of intervals in the steps of Greek music, they completed the infinite progression of ratios that formed the basis for the infinite ratios of their architecture. These sets of ratios not only showed themselves in the dimensions of a room or a facade, but also appeared in the interconnected proportions of a string of space or the whole plan (Mirian, 2011). As can be seen in the figure below, using the golden ratio and √2, this set of ratios can be seen in the dimensions of a room, facade, and in the interconnected proportions of the space or the whole plan, which Palladio 7 types of the most proportional He suggested the rooms in 4 books about architecture. It should be noted that rectangle is the most common shape in design, which is expressed by the ratio of width to length, such as: 2:3, 3:5, 8:5 and so on (Rezazadeh and Mojtaba Sabet Fard, 2012).

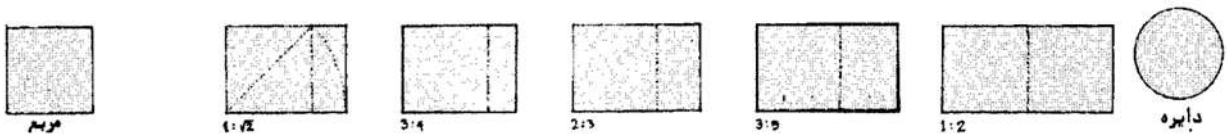


Fig 7 Palladio's theory about seven types of the most appropriate rooms (Source: Mays, 2008)

c. Le Corbusier's modular system

Le Corbusier considered the measurement tools of Greece and Egypt, which were part of the mathematics of the human body and were the source of harmony governing human life, very rich, for this reason, his measurement tool, the modular system, is based on mathematics (golden ratio and Fibonacci series) and completed the proportions of the human body (functional dimensions of

the building) (Meshkini Asl, 2001). Le Corbusier began his studies in 1942, and in 1948 he published a book called Modular, a Human-Scale Pion of General Application in Architecture and Mechanics (Elam, 2001). The second volume, Modular 2, was published in 1954. Le Corbusier looked at the modular not only as a set of numbers with a fixed agreement, but as a measurement system that was subject to lengths, sides, and volumes, and could establish human proportions and scale everywhere (Tsigichko, 2007). The main grid consisted of three sizes: 43, 70, and 113. (Their ratio was adjusted according to the golden ratio) (Ansari and Nejad Ebrahimi, 2010: 50). Le Corbusier calculated the length of an average human, which was equal to 183 hundredths of a meter, and obtained his proportions. These ratios are on the one hand: 86, 140, 226 (with raised hand) and on the other hand, 70, 130, 183 (up to the top of the head) (Kozlova, 2016).

113=70+43
183=70+113
226(113*2) = 43+113+70

d. Human proportions

The system of adjusting proportions according to human proportions is based on the dimensions and proportions of the human body. In this system, they use the theory that the form and spaces in architecture include and occupy the human body and therefore should be determined by its dimensions (Rezazadeh and Mojtaba Sabet Fard, 2012). If the size of the middle part of the body to the sole of the foot is considered as one unit, the height is equal to 1.618, which is the same number as Φ (Kashifpour, 2009: 88). According to the Holy Qur'an, man has within himself all that is reflected in the world "the best proportion" (Mirian, 2011). Man is the core of God's creations; He has the most harmonious proportions, reflecting the harmony of the divine. "Indeed, we created man with the best form" (proportion). Leonardo da Vinci illustrated the geometric dimensions of the human body by showing that humans clearly display the dimensions of the golden ratio in their bodies based on the ratio of 1.618 (Mahmoudi and Chaideh, 2010). The Vitruvian Man painted by Da Vinci based on Vitruvius, who wrote that human dimensions should be related to architecture. Vitruvius believed that if human dimensions could join with buildings, they would be complete in their geometry (Guenon, 1995).

According to Robert Lawler; "The human body includes its dimensions in all important geometric geodesic sizes and functions...the dimensions of the ideal human lie at the center of a circle of constant cosmic relations" (Lawler, 1982).

From the comparison of Le Corbusier's modular proportional system and human proportions, it can be seen that from dividing Le Corbusier's numbers to each other using the golden ratio of the line segment (BC/AB = AC/BC), that is, 2.52 = 113.70 = 43.70, which is approximately It is equivalent to √5 = 2.23 and in the system of human proportions, human height is considered as the golden number Φ, which is equal to (√5+1)/2 or Φ = 1.6180339000 (Hejazi, 2005).

From the summation of the material presented about proportional systems, it can be concluded that the proportional adjustment systems can be examined on two scales in Iran and the world, and it can be concluded that the Iranian-Islamic proportions can be called balanced proportions 2√ And 3√ and 5√ introduced that among these 5√ is introduced under the title of golden ratio and proportions on a global scale include two divisions of golden proportions and human proportions, (Elam, 2001) which renaissance theories are based on golden proportions and the modular system Le Corbusier deals with both the golden ratio and the human ratio, and in general with the golden number Φ, which is equal to (√5+1/2), and it can finally be claimed that all proportional systems

with one of the 4√2 criteria and √3 and √5 and the golden number Φ can be analyzed (Meshkini Asl, 2001). Therefore, this result can be seen in Figure 8.

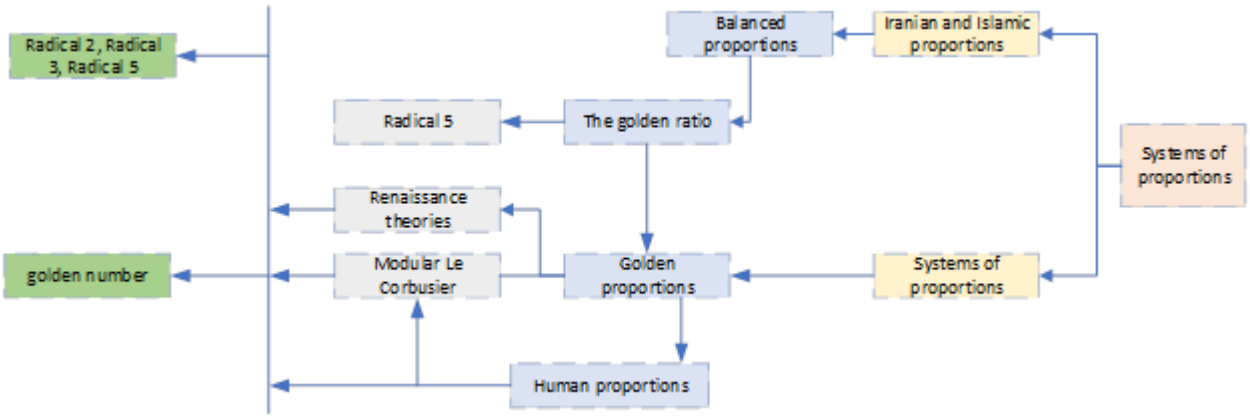


Fig 8 Diagram of proportional systems

4. Research Methodology

The research method in this research is based on the comparative approach in investigating the geometric proportions. The nature of the research is developmental-applied that the sampling of the bridges is based on the purposeful sampling and in the selection part of the participatory observers, the selection approach is snowball with the entry criteria (Gall, Borg, and Gall, 2018; Cresswell and Clark, 2019). The statistical population for the selection of participatory observers is expert people. Space users are used to score the degree of beauty, and the PC modeling system is used to strengthen the applied geometry and determine the application of proportions with each other. Sampling of random users is calculated by the amount of 384 numbers and based on the upper limit of Morgan's table. The observation is a predetermined package with a balance sheet and includes three parts: decorations, shapes, and overall form. It is divided, then based on the contribution of each geometry in its formation, a number of 1 to 5 is given. In the next step, the effect of each from the geometries and beauty of these bridges, a questionnaire with a Likert scale is designed and provided to space users. The results are entered into the ORIGINPRO software and analyzed with inferential statistics. Validity with the CVR formula for the observation tool and questionnaire is done for 20 experts, which is 0.76 and 0.74, respectively. The reliability of the questionnaire was estimated with Cronbach's alpha, which is 0.83.

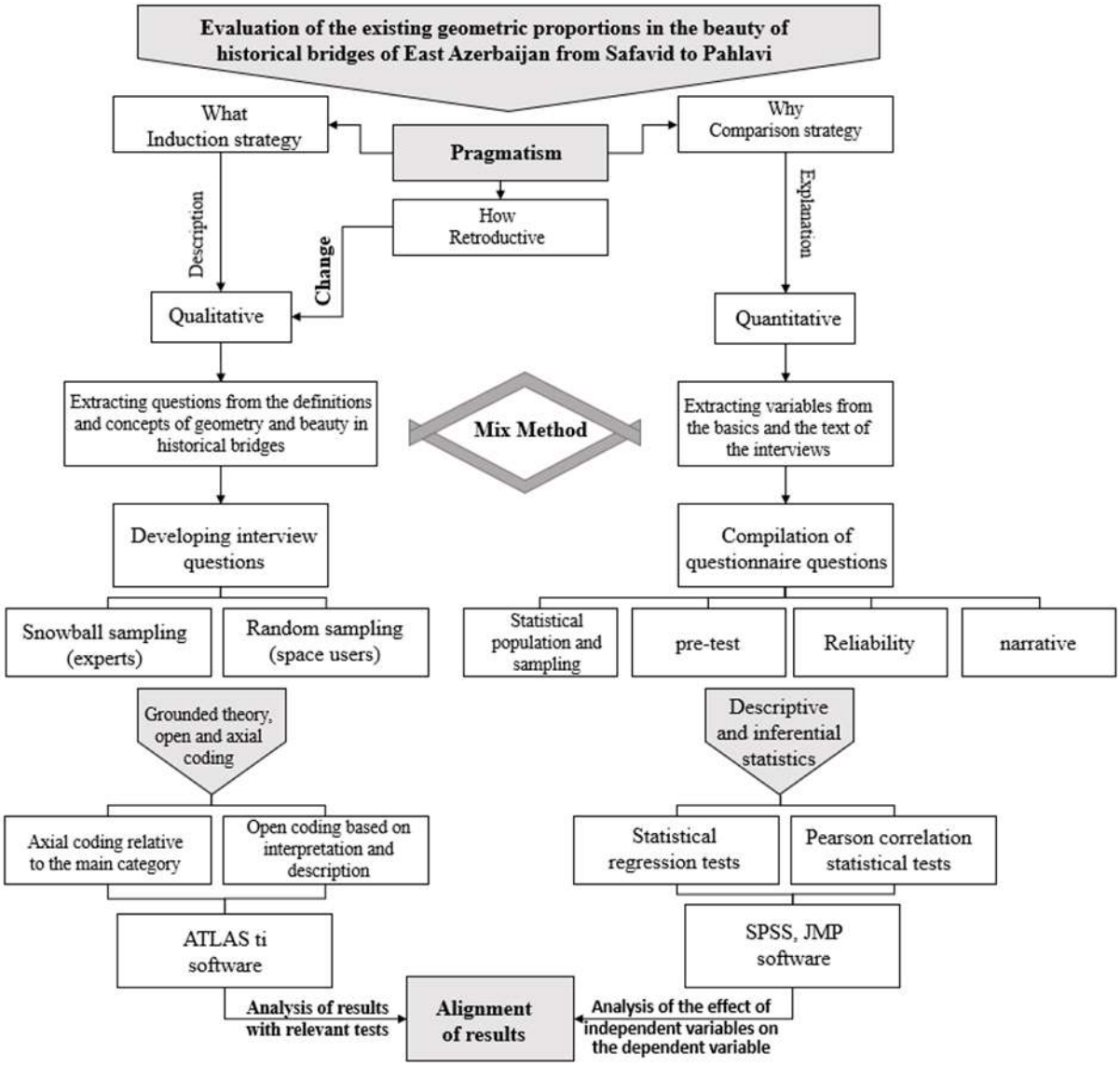


Fig 9 Research process

4.1. Measurement Range

This research uses the bridges of East Azerbaijan as the unit of analysis to select the samples. To achieve suitability for analysis, the preference system with Kendall's W is used, and items below 0.5 are removed. In the table below, the results of introduced bridges and brief explanations are given.

Table 3 Introduction of measurement range and selected bridges

Topic	Construction Period	Description	Kendall Coefficient	Image
Aji chai Bridge	Safavid	With 16 openings, it is 105 meters long and five meters wide, and it has been reconstructed and restored in every period of damage caused by natural disasters such as river flooding or human destruction.	0.746	
Tabriz stone bridge	Qajar	Tabriz stone bridge is another historical bridge of this metropolis, which dates back to the Qajar period. This bridge is located on Chaiknar Street and opposite the Stone Bridge Mosque on the Mehraneh River. It is said that a person named "Haj Azim" is the founder of the construction of the stone bridge.	0.824	
Khoda Afarin bridge	Safavid	Khoda Afarin bridge was built in Khoda Afarin city and on Aras river.This bridge consists of two separate bridges, one of which is broken and only half of it remains, but the other bridge has not been damaged. This bridge is located near Khoda Afarin Dam in "Sari Jalu" village. The distance between these two bridges is 800 meters and they are located in two regions of Azerbaijan, namely "Qara Dagh" and "Karabagh", and they are different from each other in terms of engineering and architecture. One of the bridges, which has 11 spans, is made of white stone, its height is 12 meters and its length is 130 meters.	0.723	

Qari Bridge	Safavid	It is one of the bridges that are still in use today and is reminiscent of the old generation of bridges and the not-so-distant world. Another old bridge in Tabriz is the "Qari" bridge, which was previously known as "Pacheragh."	0.596	
Sahib al -Amr Bridge	Safavid	Next to the mausoleum and mosque of Sahib Al-Amr, built during the time of Shah Tahmasab Safavid in 1405 AH, the soldiers of Sultan Murad IV destroyed it, which was restored by Mirza Mohammad Ibrahim, the Minister of Azerbaijan. In the earthquake of 1193 AH, the Sahib Al-Amr complex was destroyed It was rebuilt in 1208 AH by Jafar Khan Dinbeli	0.611	
Ancient bridge of five springs	Safavid	Other important bridges of East Azerbaijan are the ones that established the connection between the worlds of human societies in the ancient era and were placed in the shape of a crescent on the Safi river and are currently used by passers-by.	0.810	
Middle Girl Bridge	Safavid	۲۲kilometers of the Middle Zanjan road related to the 8th century AH is one of the most important crossings of the international silk road (east to west) and Dokhtar Malekan bridge related to the Safavid period are considered as other important and ancient bridges in East Azerbaijan.	0.481	
Paul Mardegh	Safavid	Mordagh Bridge has three spans, the middle span is bigger than the spans on the two sides, and its gable arch is made with native red bricks. The bridge itself is built from local stones of this region, which were extracted from the "Sanjan" mine. In this bridge,	0.377	

		there are also two small arch springs for the purpose of passing flood waters and for more beauty. In the past, Mordagh Bridge was the connection between Maragheh and Hashtroud cities.		
Shahr chai Bridge	Safavid	Shahr Chai Bridge is located 12 kilometers south of the city of Mianeh, near Taze Kend village and on the river Shahr Chai. Detailed information about the construction date of this bridge is not available, but according to the architectural style and materials used in it, it can be attributed to the Safavid era, because it is very similar to the 33 bridges of Isfahan, but it has a simpler shape.	0.830	
Qizlar bridge	Safavid	The Qizlar bridge was built on the Mardagh river, which is located between the village of "Qala Chouk" and "Qoli Kandi" in Malkan. This bridge is very important because of the type of arches and stone and brick facade, and it is full of travelers and tourists during the holidays. It is said that the construction date of the bridge dates back to 951 AH and Safavid rule, and it has been renovated several times. This bridge is still very important in the passage of the people of the surrounding villages.	0.603	
Bilankoh Bridge	Safavid	The Bilankoh bridge is located in the Bilankoh neighborhood of Tabriz, located on Abersan street and Sheikh Kamal alley. The bridge was built on the "Esberez" river, which originates from the Sahand mountains and finally flows into the Mehraneh river. This bridge, which is made of brick and stone, belongs to the Qajar period, but there are traces of another bridge near it, which	0.522	

		archaeologists attribute to the Safavid period.		

The removed bridges include Bilankoh, Murdagh Bridge, Dokhtar Miane Bridge, which after being removed due to the low score of the expert board, they inquire about the reason. They point out that the main reason for this is a combination of these things (improper repair), (inaccurate information), (lack of easy access), lack of familiarity with the expert panel.

4.2. Qualitative Findings

At this stage, after observing the researchers and evaluating them in the efficiency of proportions, percentages are started between each proportion used in different parts.

Table 4 Percentage evaluation of the available geometries of selected bridges based on focused focal observations

The name of the selected bridge	Rand coefficients of the base modulus		Golden rectangle		Golden spiral		Circles 1 to 618/1		Platonic rectangle		Radical ratio				golden ratio		Modular Le Corbusier		Ken and Shako	
												Components								
	Outline	Components	Outline	Components	Outline	Components	Outline	Components	Outline	Components	Outline	Radical 2	Radical 3	Radical 5	Outline	Components	Outline	Components	Outline	Components
Qari Bridge	15%	37%	21%	8%	16%	35%	17%	5%	19%	21%	24%	12%	14%	10%	41%	29%	21%	16%	0	12%
Sahib al-Amr Bridge	18%	24%	15%	12%	21%	19%	11%	14%	14%	11%	21%	14%	9%	8%	17%	21%	0	6%	10%	17%
Ancient bridge of five springs of Bonab	14%	18%	21%	14%	21%	18%	16%	12%	4%	9%	14%	8%	19%	18%	24%	10	0	7%	3%	4%
Tea City Bridge	8%	19%	18%	14%	15%	14%	18%	2%	1%	18%	12%	7%	19%	18%	26%	12%	1%	9%	6%	6%
Bridge girl	14%	11%	14%	9%	5	17%	15%	24%	20%	19%	15%	16%	18%	16%	18%	26%	5%	6%	12%	14%

Based on the findings of this stage, it is clear that the golden ratio with a value of 29% in the components and 41% in the overall design has the largest contribution in the formation of the geometric proportions of Qari Bridge. In Sahib Al-Amr bridge, in the components, the Rand factor of the base modulus is 24% in the general plan and 21% in the components, the highest is related to the radical ratio. In the ancient bridge of five springs of Bonab, the golden ratio with 24% in the general plan and the radical ratio of 3 for the most important components have played a role in the formation. In Shahr Chai bridge, the golden ratio is the highest with 26% in the general design and in the components related to radical 3 with a value of 19%. In Dokhtar bridge, the circles are 1 to 1.618 with a value of 24% in the components and in the general design, the most related to the rectangle. Platonic with a value of 20%.

Paul Aji Chai is removed from the selected samples due to departure from the centrality of the data as well as skewness of the results.

4.3. Inferential Statistics

At this stage, in order to find out how effective each of the mentioned geometries is in the beauty of the selected historical bridges, a visual questionnaire is distributed. In this part, recursion should be used to perform factorial component. For this purpose and to choose the type of regression, the

correlation matrix is used. The results show that they do not have a linear component with each other, and it is necessary to use multivariate regression.

Fig 10 Correlation matrix of geometric proportions in selected bridges

Based on this, multivariate regression is used, and SIGMAPLOT is used for ease of doing this. The results are presented in the table below.

Table 5 Multivariate regression, step by step types of geometric proportions in creating the beauty of bridges

Meaningful	t	β	F	**C**oefficient of determination	Variable
0.008	571/44	0.762	217/314	0.867	Platonic rectangle
0.007	365/31	0.372	147/523	0.195	Modular Corbusier
0.006	255/31	0.872	381/852	0.580	Circles 1 to 1/618
0.001	479/58	0.685	921/298	1/000	golden ratio
0.003	982/21	0.597	257/247	0.612	Golden spiral
0.001	134/11	0.436	321/644	0.656	Golden rectangle
0.009	425/24	0.852	523/845	0.645	Basic rand coefficients
0.009	132/23	0.665	254/754	0.316	Ken and Shako
0.018	121/48	0.213	541/124	0.715	Radical ratio

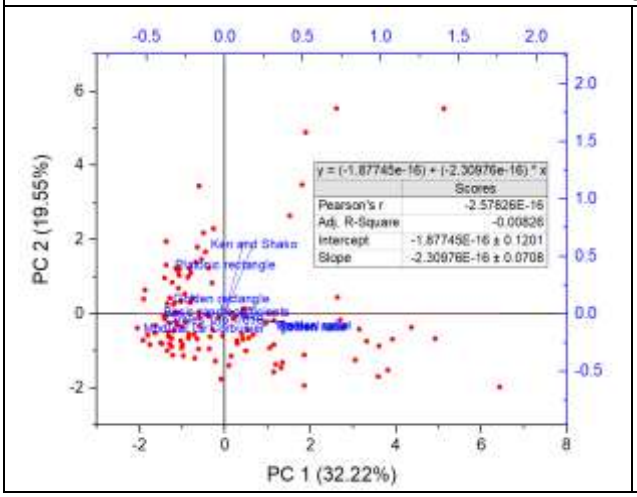
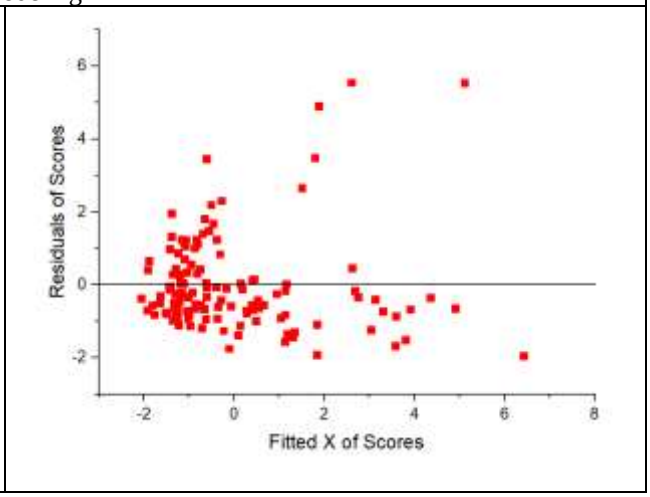
Based on the findings of the regression model, it is clear that the greatest role in creating the beauty of the selected bridges of East Azerbaijan is the golden ratio with a value of (1.000) and the least is related to Le Corbusier's modular with a value of (0.195). Therefore, the regression model of applying geometric proportions to achieve beauty is as follows;

Y= (0.867) Platonic rectangle+(0.195) Modular Locorbusier+(0.580) Circles 1 to 1/618+(1.000) golden ratio+ (0.612) Golden spiral+ (0.656) Golden rectangle+(0.645) Basic rand coefficients+(0.316) Ken and Shako+ (0.715) Radical ratio

Based on the PN modeling, it is clear that the application of the golden proportions, the radical ratios and the Platonic rectangle reinforce each other in creating beauty, and these results are the same for the base rand coefficients of circles 1.618 to 1 and the golden spiral, but Le Corbusier's

modular And Ken and Shako act separately and have different results in creating beauty.

Table 6 PN modeling of selected types of geometric proportions in the beauty of selected bridges

PN modeling	
	

5. Discussion

Based on the data distribution findings and on the basis of focused observation, it is determined that the most types of geometric proportions used in bridges are related to the golden proportions, and it seems that in all periods for its overall design in one direction or in more The general and three-dimensional forms of bridges have been used most of all in the components of the most general proportions that have been used in shapes or decorations and have been used in openings, the radical proportions are known as Asam numbers. It seems that one of the reasons for the fortifications at that time is the simultaneous application of these two proportions together. Based on the inferential statistics of the factor contribution, it is determined that the radical ratio and the golden proportions are also effective in creating the beauty of bridges, or perhaps they have had the best effect, but the rest of the proportions that have historical or territorial roots are equally effective in creating beauty. They have normal limits.

The proportions of Ken and Shako and the modular proportions of Lucor Boutzia have a smaller contribution to the creation of beauty, perhaps due to the climatic distance or the time dimension. In the PN modeling, it is clear that the use of a number of proportions lead to an increase in the effect of creating beauty in these bridges. Golden proportions, radical ratios, and platonic rectangles can be considered to increase the effect in creating beauty.

6. Conclusion

In Iranian architecture, geometry has always been used to create fortifications or create beauty in decorations or overall form. Historical bridges are one of the few urban elements that, in addition to their functional form, are also responsible for transporting people. And they are also a place for people to spend time. In the past, historical bridges have been able to remain until now due to high fortifications and play a role as a beautiful urban element.

Iran's bridge-building periods can be called pre-Safavi and post-Safavi periods. The main function of bridges is crossing, but in addition to this main function, Iranian bridges are combined with special services. Another feature is creating a different space, in addition to the passage space.

Due to the structural structure of Iranian bridges and the use of pointed arches, the way of transferring forces is such that it enables the creation of empty space in the body of the bridge. The remains of the oldest bridge in Iran date back to the 8th century BC on the Aras River, which was built by the Urartos. But the most important areas where bridge building has been necessary and popular are the mountainous regions of western and northern Iran. In this area, there are many permanent and seasonal rivers. These rivers were among the major natural obstacles on the roads. In these areas, a continuous process of building bridges, restoration for road construction, and the construction of bridges in these areas was necessary. In the Safavid period, bridge building was given too much attention and famous bridges were built in this period. The Safavids were the dynasties that made deep and fundamental changes in Iran and performed outstanding actions in terms of culture and art. He was one of the most important artistic indicators in the field of growth and prosperity of Iranian architecture. This research shows that there is the use of different geometries in a bridge, but most of them used the golden ratio in the general designs and also used the radical ratio for different components. This research showed that the application of various geometric proportions together leads to the creation of beauty and harmony.

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Investigating the Potential and Benefits of Using Building Information Modeling (BIM) in the Life Cycle of Construction Projects

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Research Article

Abstract

The construction industry is one of the broad, decentralized and highly indigenous industries of any country. In many countries, it is considered an indicator for growth and development or economic stagnation. This industry in Iran is currently experiencing a lot of inefficiencies, one of the main reasons for which is the lack of growth in the technical field. The use of traditional methods is known as one of the main factors inhibiting productivity in the construction industry in Iran, because most conventional techniques and their nature led to time delays and waste of resources. Therefore, it is necessary to use new technologies in this vital industry. Building Information Modeling (BIM) technology in construction projects is essential, including the benefits of using BIM, improving coordination and communication, increasing productivity, reducing errors, improving construction quality, etc. Therefore, in this research, the benefits of using this useful technology in the life cycle of a construction project have been investigated.

Keywords: BIM; Construction Project; Cost Management; Time Management

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1. Introduction

In the last few decades, the construction industry has faced several challenges, including low productivity and return on investment rates compared to other industries, gradual increases in labor costs, imposing unforeseen costs due to the lack of coordination among stakeholders, and time-consuming management. Changes in projects and a lack of timely and appropriate decisions have been faced.

During the last two decades, significant progress has been made in the field of knowledge and technologies for the management of civil and industrial projects with a focus on construction management. Among these advances is the use of Building Information Modeling (BIM) technology, which has many uses and benefits. Among its advantages: improving coordination and communication, increasing productivity, reducing design errors, managing execution and productivity after construction, improving construction quality, optimal management of resources including materials and equipment, and providing better decisions using powerful analytical and reporting tools. Therefore, the use of BIM in construction projects has a significant and influential role.

Building Information Modeling (BIM) have emerged as powerful tools for the Architecture, Engineering, and Construction (AEC) industries. When integrated, they allow for applications in some different areas, including design review (Roup´e et al.,2016), production planning (Muhammad et al., 2019), and construction safety (Hafsia et al., 2018). The argument often put forward when compared to non-immersive, desktop visualization, is that immersive VR provides a better understanding of scale and detail and allow people to enter and inspect environments in a similar way as they would do in real life (Han and Leite, 2021; Wolfartsberger, 2019). More recently, immersive VR has been extended to support multi-user sessions, where several participants can experience the same model at the same time (Du et al., 2018). For design review sessions and model inspection, this has been shown to enhance communication and improve collaboration among participants (Heinonen et al., 2022).

Also, despite all the advantages and benefits of this technology, it also faces some challenges. The benefits and positive effects of information models in the construction industry are such that they can easily transform many critical aspects of the project and contribute to the final success of the project. The successes achieved by information modeling are felt in all aspects, including the impact on time and cost, but the major advantage of BIM, is its integrity ability. In this research, an attempt is made to examine the benefits of this technology by reviewing published articles and interviewing experts.

2. Literature Review

Due to the prevalence of building information modeling in different countries, studies have been conducted in various fields and aspects of insurance, which are as follows:

Nor Diana Aziz et al. (Diana Aziz et al., 2016) in research titled "Building Information Modeling in Construction Management: Opportunities for Operating Managers" have discussed the impact of using building information modeling in construction management and its benefits by reviewing previous research. Among the critical effects of using BIM, it was determined as follows:

1- Effective operating cost 2- Decision making in less time 3- Suitable information sources for decision-making 4- Better documentation system 5- Establishing cooperation and work flexibility 6- Updated information and interference control.

In another study, Becerik-Gerber et al., 2012, on "application fields and information required for construction management based on building information modeling" by preparing a questionnaire and interviewing experts familiar with this technology. Investigating the practical fields of using building information modeling in construction management. In this research, two possible information scenarios during construction management have been discussed and answered in the framework of building information modeling.

Kim and Hong (Kim & Hong, 2018) in article entitled "A Study on Applied Services for Effective Crisis Management Using Building Information Modeling" examined the achievement of effective crisis management using building information modeling.

Peter Metejka et al. (Metejka et al., 2016) in research entitled "Incorporation of building information modeling in the final stages of the project life cycle in unprepared environments from the perspective of construction management," the benefits of using building information modeling in the operation phase of projects They explain that in the previous phases, no activity has been done in the field of building information modeling. In this study, three different projects that were used in the exploitation phase of BIM have been examined.

Wang et al. (Wang et al., 2015) in another study titled "Considering construction management in the project design phase using building information modeling: framework and case study", They presented a standard framework for using building information modeling in the design phase.

Alexander Nical and colleagues (Nical & Wodynski, 2016) in an article entitled "Improving construction management using BIM" concluded that to optimize construction management, building information management should be maintained from the beginning of the project to the operational stage. to be Also, the applications of building information modeling in the life cycle of the building have been investigated.

Al-Ashmori et al., (2020) and his colleagues distributed 590 questionnaires to the firms and experts in this field. They concluded statistical analysis that efficiency, time, cost, cooperation and communication among individuals have been the most significant advantages. Moreover, trust, respect, commitment and the initial interaction can be regarded as Stimulants.

Mohammad Farhan Arshad et al. (2019) Suggested a standard framework for the projects using the BIM in article entitled "Arbitary Risk of the BIM".

Yije Kim et al. (2022) determined the necessary information for the data collection of the BIM-based on the drawing requirements of construction at the documentation stage by using Delphi Method.

Sonmez et al. (2022) offered the intelligent payment management system for the advancement of the construction project, which was modelled by the BIM. The mentioned intelligent system makes it possible to make payments to fewest pitfalls compared to conventional methods.

Cheng Lin et al. (2022) studied the problems regarding the repairs and maintenance of the BIM and discussed the effectiveness of the recommended system by conducting a case study.

Rojas et al. (2019) in the research, investigated the usage of the BIM and the application level of BIM. Finally, they provided the evaluation tools of BIM at the stages of designing and planning the construction projects.

Wei Zheng et al. (2022) Conducted research regarding the usage of BIM in the implementation of prefabricated houses, industrialized buildings, reconstruction of prefabricated houses in the virtual ambiance, and the pre-implementation stage.

Hongwei Li and Chongyu Wang (2022) recommended the use of BIM technology in green buildings and their constant evaluation.

Yinchen You et al. (2022) examined the safety of high-rise metal skeletons of buildings by analyzing the limited factors and BIM technology.

Lirong Liu et al. (2022) analyzed the management expense of civil projects by applying the BIM technology.

AL Rahhal et al. (2022) offered a framework for choosing suitable substances to prepare the floor of buildings by utilizing the AHP technique, value engineering, and BIM technology.

Wangchao Shen (2022) Manage the consumption of construction materials by utilizing the BIM technology and internet of things.

Gen Li and Haining Tian (2022), in a review paper, analysed the articles published from 2012 until 2022. These articles focused on the management of energy consumption in the buildings and the upcoming trend of the BIM.

Baydaa Hashim Mohammad et al. (2022) in a review paper, examined the relations between the BIM and the Internet of Things.

Knight et al. (2010) believed that the compensations of interference of mechanical and electrical installation with the elements of building sometimes account for up to 25% of the total cost of project, which can be avoided in the design stage by BIM technology.

Parvan et al. (2012) from study of 30 construction projects that have utilized the BIM technology, concluded 30% of the time needed for designing, 10% of the time required for constructing, 16% of interference and repetitions in the entire project will be reduce.

Chelson (2010) concluded that the use of BIM and increased collaboration between team members significantly reduced interference by 90% and also reduced delays in the construction process, ultimately resulting in 35%time savings, 20% in expenses. BIM improves project control and planning system.

Kymmel (2014) found out that recognizing the interference between structure and mechanical, electrical installations would be perfectly feasible before the stage of implementation by using the BIM.

Eadie et al. (2014) researched about barriers of BIM in the United Kingdom. These barriers are as follows: the cost of purchasing software and hardware, the cost of instructing the staff. The lack of technological knowledge, legal problems, Lack of prospects, Lack of culture of Flexibility, not approval by senior manager of the Project, not acceptance by the staff, and finally, the change of methods.

Kekana et al. (2014) reviewed the articles written, and the research conducted in South Africa. They detected the barriers of BIM. They concluded that the main problems are as follows: the lack of standard regulation regarding the use of BIM, the lack of designers familiar with this technology, the lack of insurance policy to support the technology.

Zahrizan et al. (2014) studied the construction industry in Malaysia by handing out questionnaires to the experts. They reiterated that the lack of awareness regarding BIM, the high price of BIM, the timing of BIM, the unwillingness of employers, customers and contractors have been the significant barriers. They also added that the obligations imposed by the government and promotion BIM on the part of all the teams involved in the construction industry would guarantee the success of this technology.

Santos et al. (2017) reviewed the research conducted in the field of BIM from 2005 until 2015 and separated all the research into nine main categories, which are as Follows based on the order of frequency of articles:

1- collective environments and interoperability 2- sustainable construction 3- acceptance and standardization of the BIM 4- programming the BIM 5-image processing and Laser Scanning 6- the

management of facilities and the analysis of safety 7-the management of construct 8-review papers 9- BIM and particular information

Jin et al. (2017) utilized the BIM to model construction information and referred to lending support to the BIM in many countries, including China.

Cao et al. (2017) researched the effects of obligations imposed by the government and related agencies to support the use of BIM technology.

Hanna et al. (2014) conducted a Survey of experts and reviewed the activities done, mentioning the advantages of the BIM for electrical installations.

Smith (2014), who did an article entitled the utilization of the BIM and global strategies studied the published papers, mentioning the innovative and achievements of countries in this field.

Jones and Bernstein (2014) researched the ten largest construction markets of the globe, including China and India, which showed that the usage of the BIM is on the increase. The utilization of BIM will reduce 56% of changes and 59% of disparities in the construction process.

Giel and Issa (2013) measured the payback period which using the BIM.

Khosroushahi and Arayici (2012) surveyed of contractors in Finland, reviewing the published articles and studying the advantages and challenges of using BIM.

Morlhon et al. (2014) researched the advantages of the BIM and reviewed the articles published in this field.

Yu Cheng Lin et al. (2016) Conducted research on the management of the BIM to boost the efficiency of the BIM implementation with the help of contractor.

3. Research Method

This research is descriptive-analytical. In the first stage, by studying library resources and related articles and the work processes related to the management of construction projects using previous researches and conducting interviews with experts, managers various applications of BIM were extracted. In the second stage with the analysis, the results were categorized according to the life stages of the project.

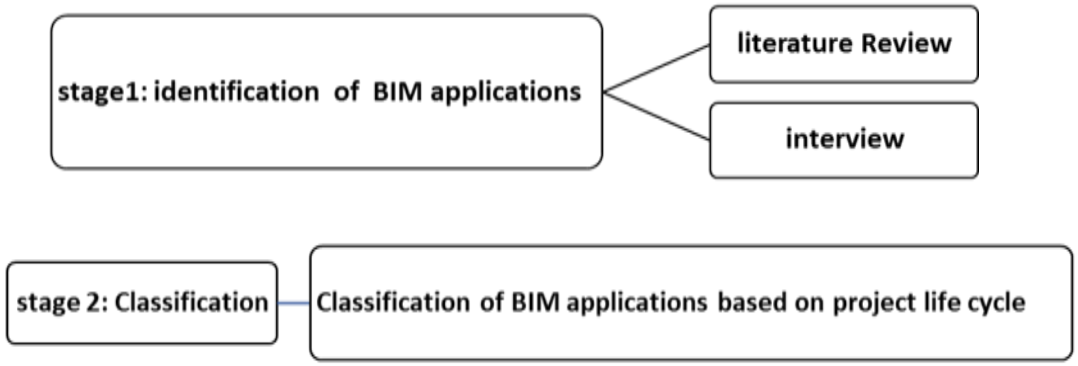

Fig 1 Research steps

4. Introduction on BIM and its Applications

Using of construction information modeling and new software and hardware technologies has opened new horizons for the construction industry in developed countries. When we use BIM technology, all the designers and stakeholders of the project work together as a team in a

coordinated and integrated manner. All ideas are evaluated without much cost and time. In this system, unlike the traditional method, all dimensions of the project, are simulated with rich information and planned for each one of them before construction. Therefore, from the begin, specialists from different part will have a single mental image of the project (Fazeli et al., 2020).

The use of the construction information modeling system causes the instant exchange of information between the project's stakeholders and as a result, minimizes design errors and interferences, the project will be completed on time. Also, increase productivity and annual financial turnover. By adopting advanced digital techniques for construction projects, the quality of design and construction is improved and the economic problem of construction industries is reduced (Srao et al., 2020). On the other hand, BIM is a great help for integrating the people involved in the project. Therefore, with this method, the problem of people's lack of knowledge about other specialties and disciplines involved in the project has been solved. Great goals can be considered for projects that use this technology (A.B, 2020).

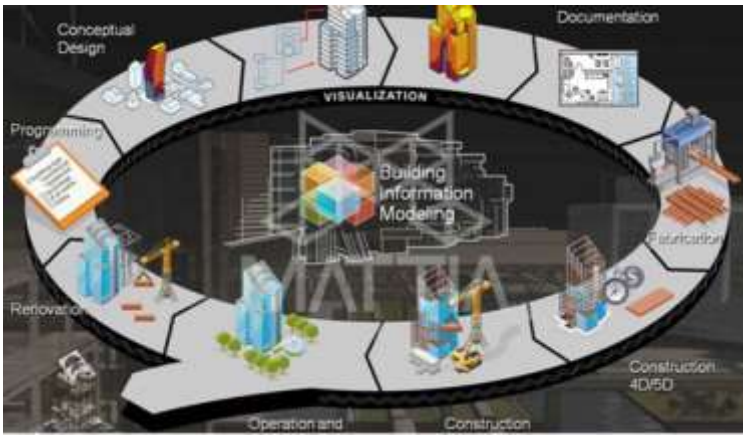

Fig 2 BIM technology applications in the building life cycle

Fig 3 BIM level and dimensions (Panteli et al. 2020)

4.1. BIM Application in the Pre-Construction Stage

a. Carrying out integrated design of the project and identification of interference

The BIM process makes it possible for the design team to simultaneously work on different parts of the project and share the 3D model of the project. At any moment, all team members are aware of the latest changes in the final model. This creates more empathy between the members of the

design team and reduces errors in design, reduces rework and increases the productivity of staffing, reduces the duration of project design and presents and reviews various design scenarios in three dimensions.

In the BIM process, it is possible to adapt the models designed by different members of the design team in a three-dimensional environment and to identify possible collisions between different parts. This is despite the fact that in the traditional process of design, identification of interactions and collisions between other parts is done by human power, which is time-consuming. While interference is identified by software in the BIM, which has higher accuracy.

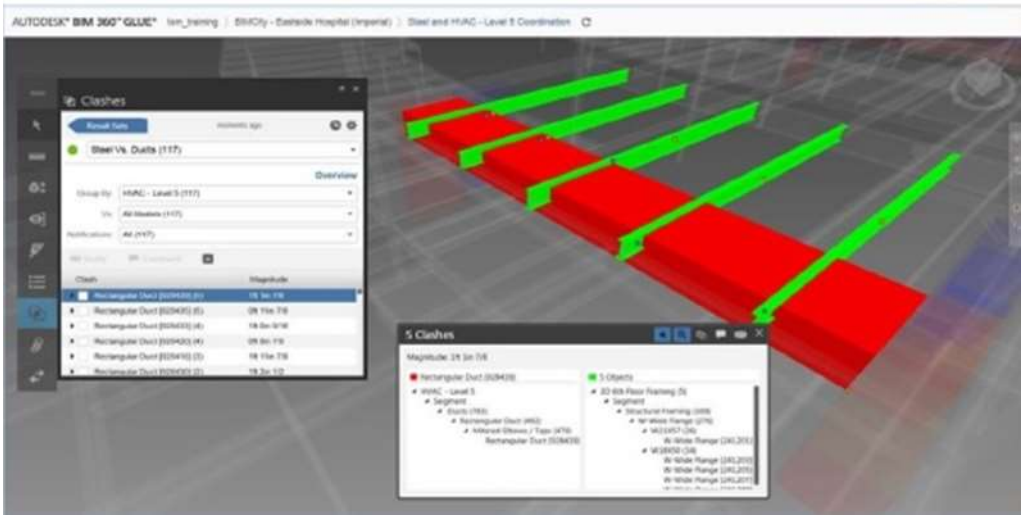

Fig 4 Detection of facilities channel interference with composite roof beams

b. Quantity surveying and estimating of the project using 3D model

Measuring in the traditional way depends on the experience and expertise of human resources. In the traditional method, meterer is not aware of the latest changes applied in the project, as a result, the project estimation is always accompanied by errors. In the BIM process, by using the one-dimensional model of the project, the exact amount of materials, manpower and machinery required can be met, and by using the price list, the actual cost of the project can be determined, thus increasing the speed and accuracy in meters and the project is estimated.

The use of BIM for measurement and estimation increases the speed and accuracy of the measurement, allows for a more accurate examination of the cost of different design scenarios, reduces disputes and claims, and estimates the cost of the project according to the latest changes in the design.

c. Creation of 4D and 5D models for project management and control

The BIM process connects the project schedule to the 3D model. As a result, the project management team can objectively observe the physical progress of the project. Four-dimensional models allow for a more accurate understanding of the sequence of different construction stages, definition of "what if..." scenarios to choose the best method, workshop management by showing the progress of work, determining the location of machines, analyzing the movement of machines and cranes. They provide control of accesses, identification of interactions between work team and planning of resource allocation and estimation of values.

4D models (3D model plus time dimension) can be connected to the cost of each activity. by five-dimensional model, total and partial cost and the S-curve of the project can be created, managed and controlled.

The BIM process allows accurate estimation of the materials used in the project by using a 4D model. In this way, the time distribution of the amount of consumed materials can be easily calculated. As a result, the supply chain management and project procurement can be adequately planned and controlled. Another advantage of the BIM process is the automatic preparation of the list of required materials and equipment on a weekly or monthly basis based on the time distribution of the materials and equipment used. One of the advantages of this approach is timely ordering and supply of materials, optimal use of workshop space, and significant reduction in resource and time wastage.

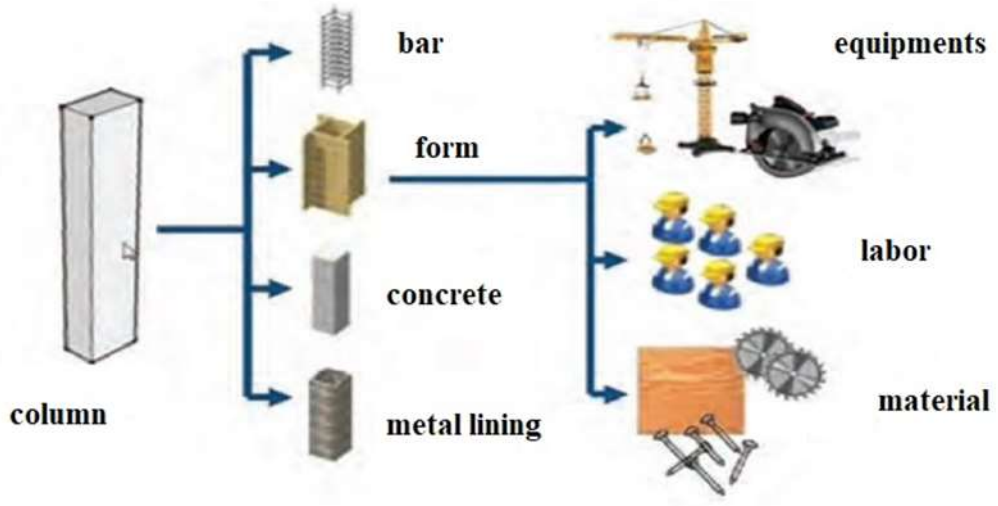

Fig 5 Estimation of the volume of materials and manpower and machinery in the meter process by BIM

4.2. Use of BIM in the Construction Phase

By creating a 3D model of the project using the BIM process, the project management team will be informed of the changes made in the project at the end of each working day.

Optimizing the location of temporary facilities, material depots, machinery locations, etc., is of great importance in industrial workshops such as refinery construction workshops that are limited in terms of working space. Optimizing the placement of temporary facilities and machines reduces transportation distances, increases the productivity of machines and manpower, and reduces the time and cost of the project.

The BIM process provides the possibility of preparing accurate as built maps by using laser scanning technology and photogrammetry technology for renovation, treatment and maintenance management.

This technology leads to the production of "electronic 3D model" containing complete dimensional information of the industrial area, including structural, mechanical, equipment and piping parts. BIM technology, generate executive plans for installing new equipment and systems, and product Dismantling plans for parts of the existing situation that must be dismantled.

Printed maps during the period of operation and maintenance of the project lead to the creation of a large volume of documents and maps, which increase in volume during the life cycle of the project, and their maintenance is costly.

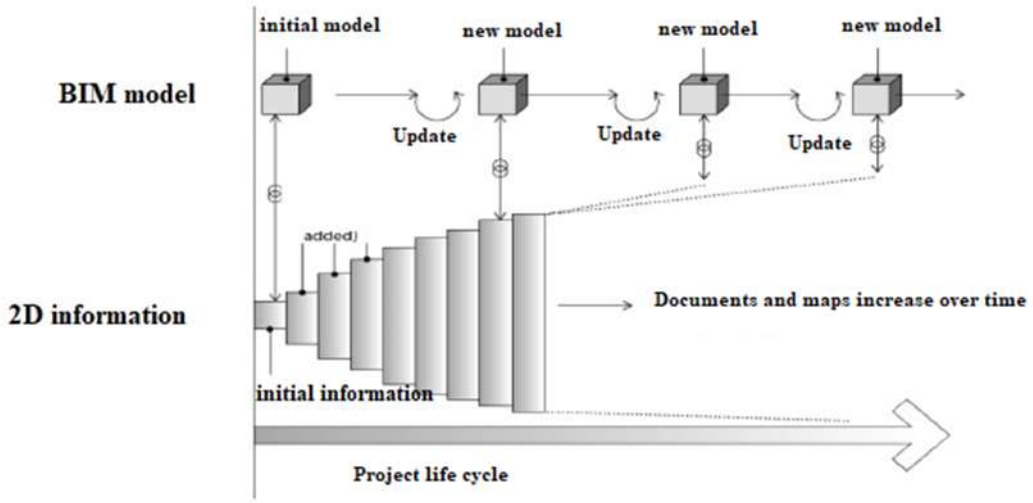

Fig 6 Comparison of the use of BIM and 2D maps during the project life cycle

This despite even though in the case of using 3D models, a 3D model is permanently updated every time the project is renovated or repaired. Another problem in two-dimensional maps is their lack of integrity. So, in case of a change in one part of the project, all the maps must be modified separately. This is despite the fact that in 3D models, the desired changes are applied only once in the model. Management and maintenance system by using of BIM process from connecting the 3D model to the information database related to the period of operation, repairs and maintenance, including: technical specifications of equipment and facilities of mechanical and electrical structures, specifications of manufacturers, sellers and supporters of each of equipment, operation, and maintenance period of each equipment, prioritization of each equipment based on strategic structure, necessary instructions for repair and maintenance of each equipment, price of each equipment and costs related to supply, replacement, and Project maintenance is created. Among the other applications of BIM is the analysis of the energy consumption in the building. Analyzing energy consumption using traditional methods is very difficult and time-consuming. The BIM team uses parametric optimization solutions at different stages of building design, which determines the target variables and functions according to the client's request, checks hundreds of models by algorithm and selects the best option according to the function. specifies the target. Optimization can be used in different stages of design and for different purposes, some of which are as follows:

Optimizing the building form in different stages: by defining the objective function and variables considered by the employer, the objective function is determined based on climate analysis, project topography, architectural concept, structure details, construction costs, and other parameters related to the project.

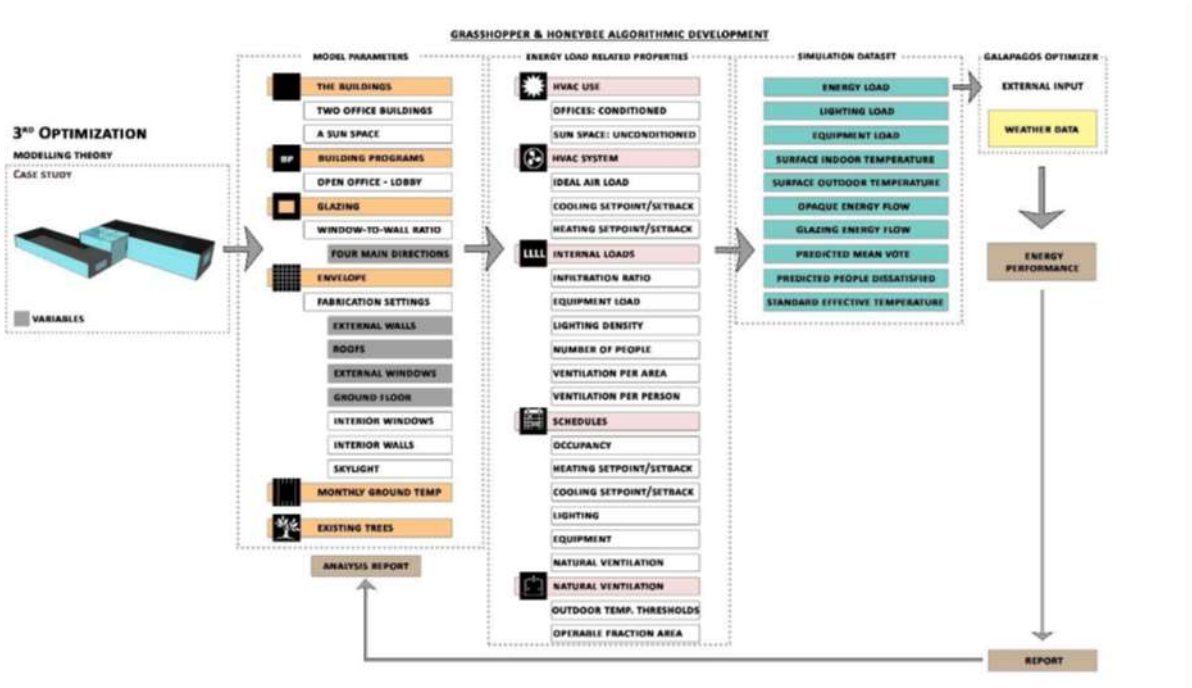

Fig 7 Steps to optimize energy consumption in the building using BIM

Optimization of canopies: This optimization of the design stages of the details of the shell, whether the design of the system of canopies or the comparison of different modules of the canopy system as a second shell, is done by considering the factors of visual comfort and other parameters related to the project and the client's needs. Optimizing the design module of all building components, including walls and facades, which is used to reduce the amount of material wastage, and gives the employer a suitable tool for choosing structural and architectural modules, including the facade and building shell. BIM applications during the life cycle of the construction project are summarized in Table 1.

Table 1 BIM applications in different stages of the life cycle of the construction project

Row	Construction stage	Application
1	Pre-construction	Integrated design of the project by different groups and the possibility of identifying collisions and interactions between plans
2		Quantity surveying and estimating of the project by use of a 3D model
3		Providing virtual reality and augmented reality models to create a correct and complete view of the project and control implementation using extended reality models
4		Creating four and five dimensional models in order to comply with the full scope of the project and not

		to forget some of the project activities and costs and to create a better view of the construction.
5	during construction	Intelligent supply chain management, procurement and stockpiling of the project
6		Interference detection between different project components
7		Creation of four and five-dimensional models for project management and control
8		Optimizing the movement of heavy machinery and cranes
9		Optimizing the location of the workshop
10		Data entry of all project equipment and documents to different elements
11	After construction	Creating an intelligent program to manage the maintenance and operation of the project
12		Preparation of detailed plans such as construction (As Built) using laser scanning and photogrammetry technology and intelligent monitoring of project progress

5. Conclusion and Discussion

The main applications of Building Information Modeling (BIM) in the life cycle of construction projects are: 1- Design and Modeling: BIM allows engineers and designers to create accurate 3D models of buildings and infrastructure and rapid evaluate design improvements, changes and proposals. 2- Project planning and management: Using BIM, digital project models can be used as a reference map for planning, resource management and coordination between different project teams. 3-Analysis and simulation: BIM allows to perform various analyses such as static and dynamic analysis, cost and time analysis, and simulations of construction and post-construction operations. 4- Execution and construction: using BIM, detailed information related to the construction and execution of the project is obtained and translated directly from the digital models, and therefore can help improve the quality of construction and reduce errors. 5-Productivity and benefit: After construction is completed, BIM can help operational and maintenance managers manage detailed information about infrastructure and equipment and improve productivity. 6-Management of changes and maintenance: BIM allows managers of changes and maintenance to manage detailed information related to the history of the current state of the building and support correct decision-making. By replacing traditional processes with digital processes, this helpful technology improves the efficiency and quality of construction projects and helps better coordination between project team members. According to the authoritative report of McGraw-Hill, in recent years, the benefits of using BIM are: Improving 75% coordination and communication of work teams, 48% reduction in rework and change orders, 57% reduction in errors during the design period, 52% reduction of errors and omissions in project documentation, 48% increase in the description of new services, 53% increase in new business markets Also, the long-term benefits of implementing project information modeling are as follows: 17% reduction in project duration, 16% increase in project profit, 12% reduction in project costs, 28% reduction in lawsuits

Some of the barriers influencing the use of the BIM are the lack of support from the authorities, the lack of obligation regarding the use of the BIM, the lack of instruction facilitating the use of the BIM in related organizations, the lack of official rules to support the implementation of the BIM. To remove the barriers mentioned above, there should be cooperation among those who decide at different stages. The use of the BIM will be widespread when governments, communities and guilds embark on introducing this innovative method and raising awareness regarding it. In the next stage, they initiate making laws, providing the related applied standards and the standard BIM Contracts. Following the completion of the acceptance stage, the stage of inter organizations embark on the removal of difficulties and challenges faced with interested parties while interacting with each other.

The results of this research will have widespread applications for the senior managers and contracts involved in the Construction industry. The potential clients will be able to improve the BIM by being inspired by prioritizing the barriers and challenges and providing implementation at the organization stage and interorganizational stages from the technological and educational perspectives.

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Examination and Study of Zero Energy Buildings in the Case Study of BCA Academy, Masder Institute

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Research Article

Abstract

The energy crisis and the pollution caused by the fossil fuels combustion and the increasing acceleration towards the use of these resources have led human beings to use clean and renewable energies. The fossil energy resources' limitation and the its price increasing and the lack of security and stability of the energy market along with the pollution and the earth warming have caused that designers search ways to realize zero energy architecture. Zero energy buildings with the intelligent use of renewable technologies creates balance between energy consumption and production. In these buildings, we are witness that as a part of the surrounding environment and nature, they not only does not cause the energy loss, does not cause environmental pollution, and does not have a negative impact on human health, but also with reserve and optimize energy consumption, having materials that are compatible with the climate and being in the ecosystem cycle, moves towards the sustainable development goals realization. The present research wants to find solutions for achieving zero energy architecture by the successful case examples study in the world in five categories; passive solar system, lighting performance improvement, the building envelope performance improvement, energy load management of devices and equipment, and using renewable resources. And the conducted studies indicate that passive solar solutions have more efficiency and variety than other solutions.

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Keywords: Zero Energy; Solar Design; Photovoltaic; Renewable Reources

1. Introduction

Sustainable architecture has been paid attention in response to environmental pollution, energy shortage crisis and limited environmental resources. Buildings consume about 40% of energy consumption of the country and play a role up to the same extent in the production of polluting gases, especially CO2. The necessity of preserving life on the earth planet and its essential resources for the present and future generations, was proved sustainable development approach in the last decade of the 20th century. This global approach tries to give response into five basic needs: protection and development integration, providing basic biological needs of human, achieving to social justice, autonomy and cultural unity protection (Torcellini et al., 2006).

In the years 2000 to 2015, the use of renewable energy has special importance and paid attention to it in various parts of the industry. So, in order to the widespread use of new energy, study and research about renewable energy, its development and use in various parts of the industry, especially the building industry, is an undeniable necessity (Marszal et al., 2011).

The augmentation of the world's population, the view of comfort for life, and the constant dependence on the consuming energy of its ready - burned sources, on the other hand, adds up the irreparable discoloration of the environment. While the cost of supplying the energy of the building over time and the use of which it is applied to the exploiters, architecture can in particular be reduced to the designs of the necessary tools and to the use of new energy and the quality of human existence (Iranmanesh ,2020).

A zero energy building, which is known as a net zero energy building, is a building with zero energy consumption, it means that the required energy in a year is exactly equal to the amount of renewable energy produced in the site. These buildings do not cause increasing in the rate of greenhouse gases. These buildings goal is reducing the released carbon and reducing dependence on fossil fuels. (Wang et al., 2013).

2. Renewable Energy

An important principle to access a zero energy building is to provide the building's needed energy from accessible renewable energies. There is no specific guide to choose the type of renewable energy, but wind energy and water waves are usually used for coastal areas and islands, geothermal energy is used in temperate zones, and solar energy is used in arid and semi-arid zones. However, the feasibility study of using renewable energy and determining its type and rate should be done separately for each project (Goldemberg, 2012).

Zero energy buildings use renewable technologies to reduce energy consumption. The number and type of these technologies use depends on the building’s type and is not predefined. It should be noted that these buildings benefit from technologies combination and do not rely on a specific type of them. The most important technologies in zero energy buildings are as follows: 1- photovoltaic, which can be used in two types, crystalline and amorphous, 2- wind energy, 3- biofuel, 4- solar heating, which is done in both flat and tubular forms, 5- The use of static solar systems, the most common of which is the solar greenhouse. In early 1111, Peabody Trust, which is one of the largest housing institutions in London, chose ARUP great company as the designer of the Beading Zero Energy Development program (http://www.energysavingsecrets.co.uk).

2.1. Wind Energy

By converting the wind's kinetic energy, wind energy may either be transformed directly into mechanical power or indirectly into electrical energy. The wind turbine is an essential part of any wind energy system since it is the component responsible for converting the potential energy of the wind into a form of mechanical power that can then be used in various contexts. At the beginning of the 20th century, construction began on the first wind turbine designed to generate electrical power. (Sayed et al., 2023).

3. Zero Energy Buildings

The US Energy Department defines zero energy buildings as follows: buildings in which a balance is created between energy consumption and production through renewable technologies applying. These buildings combine artistic expression, useful energy design principles and equipment with production of renewable energies on site and meet the energy needs of the residents. Zero energy is a building that is very efficient and produces its own energy and produces as much energy as it consumes in a year. It can be said zero energy buildings have two distinct orientations: 1- reduce the need (demand) of energy 2-produce energy from renewable sources. In the definitions related to zero energy buildings, should pay attention to the following points: a. A zero energy building does not mean zero energy consumption. b. These buildings are not independent from amenities. c: The use of these buildings does not mean energy rationing. d: Energy in these buildings is not infinite (https://energy.appstate.edu/do). Therefore, energy house, in order to design zero energy buildings, tries to apply the latest methods and standards such as ASHRAE 90.1, ASHRAE AEDG, IECC and minimize building's needed energy rate and using various time-based building performance simulation software such as IES VE and Design Builder to control the thermal behavior of the building at different times and determine the building exact energy consumption. In the following, using specialized software in the renewable energies field such as PVSOL and T*SOL, the annual energy production magnitude in the building is determined, and with the improvement of consumption and production conditions, the building annual energy balance becomes zero (http://homeenergy.ir). It should be noted that according to the DOE definition, zero energy does not have any difference from a normal building in appearance.

In addition, zero energy building was categorized into 3 groups, namely the low-rise, high rise and town for zero energy structures. The "Energy-Saving Strategy 2011" was officially adopted by Japan, which aims to continue to limit both structure energy and emissions to zero technology under the guidance of German Passive House Institute, zero energy structures were established as greenhouse (Belussi, and Barozzi, 2025: 15).

3.1. Zero Energy Buildings Advantages

Most zero energy buildings apply the electrical grid to power storage, but some of them are independent from the grid. Energy is typically restrained on-site by energy-construction technologies such as solar and wind energy, while total energy consumption is reduced by lighting and high-efficiency HVAC technologies. The zero energy goal is becoming more feasible because the cost of alternative fuels decreases and fossil fuels increases. The modern zero energy buildings progress not only has been gained in energy consumption and building construction, but also there are significant developments in academic research and detailed information is provided. Zero energy buildings can be a part of the smart grid. Some advantages of these buildings are:

1. Compatibility with nature
2. Energy consumption and energy demand balance
3. Passive energy's maximum use
4. Energy demand reduction
5. Electricity consumption reduction
6. Remove unnecessary energy consuming systems
7. Just sufficient design
8. Zero fossil fuel
9. 100% use from renewable energies
10. Heating through inactive systems
11. Buildings' zero heating
12. 50% reduction in drinking water consumption
13. Using ventilation system without mechanical vehicles
14. Optimal use of wood waste and biofuel production
15. Easy maintenance (http://homeenergy.ir)

3.2. Zero Energy Buildings Disadvantages

1- Initial costs can be higher. 2- Very few designers or home builders have the required skills or experience to build zero energy buildings. 3- The new photovoltaic solar cell equipment technology price decreases approximately 17% annually, as the result the amount of exist capital in the solar electricity system production decreases. 4- As the mass photovoltaic production reduces its price, the financial supports allocated to these projects will gradually stop.5- Each home may use zero grid energy average over a year, but it may require energy when peak demand for the grid occurs. In such case, the grid capacity should provide electricity for all loads. (http://homeenergy.ir)

3.3. Design Principles

The general principle in the zero energy buildings design is to reduce energy consumption as much as possible. The Zero Energy Houses Association of Canada offers two general solutions for these houses design:

1- Appropriate design of the building structure and physics. That by observing its principles - which will be discussed later - we find a 70 to 80 % reduction in energy consumption. 2. Renewable energy sources use such as solar energy, wind, biofuel. This is possible by applying reversible technologies in these houses. In general, there are five solutions for realizing zero energy buildings. (http://homeenergy.ir)

a. Design of Passive Solar

It refers to systems, that after converting radiant energy into thermal energy, the control of energy flow resulting from natural ways without using any secondary energy or at most with very little energy consumption is done. Design of passive solar actually refers to the ability of building to absorb, store and natural energy distributing as it is needed and according to the specific climate of the project site. The basic types of passive solar systems are: (1) water heater. (2) Solar chimney. (3) Solar window (4) Trumpet wall (5) pond roof (6) atrium (7) double skin facade (8) greenhouse (9) green wall and roof. Studies conducted by braker, 1996, show that the usual teaching factors increased energy to 10 times more. The architect part of the building can increase the average cost from two to five times the normal use. if we add electric and mechanical plants, the amount will

increase to twice the normal use. the remainder of the ten times as large as 2. At first glance it worried you that the architect was involved with the engineers and the people. There are two acceptable reasons why one of the architect's strategic decisions is important to the building. In the first place, they are closely connected with a building that is very rare. It can only happen if the building is completely replaced. The management should be able to encourage people to improve energy. Secondly, that the grand trio were not operating apart, and that the great - scale strategy of building energy was used to design the structure and depend on the behavior of the building. Apart from decisions that are used in architecture as a means to create energy, it is also a renewable energy, and, indeed, much of it is devoted to the never renewed energy that comes from fossil fuels, to use the deactivated systems by means of architecture, and to create environmental conditions.

b. Improving Building Spatial Envelope Efficiency

The building spatial envelope plays a very important role in reducing the building thermal demand. The general solutions that are in this category mainly are:

Optimal form choosing: the mass form of a zero energy building should be simple and as small as possible. From theoretical point of view, the ideal form for a low-energy building is sphere. The best form has the lowest surface-to-volume ratio, and try to make this ratio less than or equal to 1. The overall shape of building, should be square and rectangular, as much as possible, so that it contains at least corners and surrounding walls (Olgyay, 2015; Berköz, 1977).

Optimization of the widening to wall ratio (WWR): as this ratio is high, it leads to excessive entering of light in to the space, creating glare on the screen, fading in equipment floor construction, and printed plates, heat loss in winter and excessive heat input in summer. The conducted research in the lighting strategies field in the building indicates that the WWR=0.20-0.30 ratio is a suitable and reasonable ratio for the overall building (Cortese et al., 2013; http://buildingscience.com)

Improving the windows' thermal performance: In order to improve the windows thermal performance, the following 5 criteria should be considered:

u Factor: (U Value) This factor determines that how much heat passes through a building component such as a window. A triple layer insulated window can have U-value = 0.09. For many common double-layer windows, this magnitude is equal to 0.35. If the building walls are insulated well and the WWR ratio is low, in this case can use a window with U value=0.40. (Green Garage, 2009)

Solar Heat gain Coefficient (SHGC): This coefficient determines transmitted sun's thermal energy rate through a window. This coefficient has a value between 0 and 1. Therefore, to improve the windows thermal efficiency, the appropriate SHGC should be chosen. In this choice, the provision of sufficient daylight, the absorption of solar heat in winter and minimizing the absorption of heat in summer should be considered. For this purpose, it is considered SHGC=0.30 for the east, west and north views and SHGC=0.55 for the south view. (Gratia, and De Herde, 2003).

Low Emissivity Glass: Choosing this glass type has a significant effect on the light entrance and reducing the absorption of solar heat.

Visible light transmission (VLT): The value of this factor determines the visible light magnitude passing through a window, which has a value between 0 and 1. For normal windows this value is between 0.3 and 0.8. The optimal VLT value is about 0.5, which maximizes the daylight entrance and also reduces glare. (Gratia, and De Herde, 2003).

Light to thermal absorption ratio: This ratio compares the light transmission efficiency with its thermal absorption. The higher is its value, means that the window has reduced the absorption of the sun's heat and has brought more light into the building. The weakest state has a value less than 1 and the best state has a value greater than 1.55. For a building with high energy efficiency, this coefficient should be 1.67 (VT 0.50/SHGC). 0.30=1.67) (Gratia, and De Herde, 2003).

Improving the building insulated condition: The best situation is when the building is completely air-light. This is done by adding high-performance multi-layer insulator to the common air structure or by using prefabricated systems in the place for the walls. These prefabricated systems in the form of structural insulating panels (SIPs)-insulated panels and insulated concrete (ICFs)-forms. (Hausladen, 2005. Spiru, P. 2014)

c. Building Lighting Performance Improvement

There are three strategies to improve building lighting efficiency: 1) maximum use of daylight. 2) Replacement of low-energy consumption lighting systems (3) sensors' use to detect users (Watch, and Tolat, 2012). Daylight should be the primary source of light supplying and artificial light should be used as an auxiliary source. Normally, the depth of light entrance is 4.5 meters from the space light-reflecting edges during the day, and the use of light shelves increases this depth up to 14 m. (Frej, and Browning, 2005). Combination of ambient and thematic light should be used, as much as possible, and LED and CFL systems should be used instead of incandescent lamps (Marszal et al., 2011).

d. Electrical Devices and Equipment Energy Load Management

One of the ways to reduce energy consumption in offices is to manage the electrical devices energy load. This is done by monitoring electronic devices through the users' smart dashboard (ID-O) wirelessly or cloud-based. This system automatically exits electrical appliances from circuit when they are not in use (Lobato et al., 2011; New Buildings Institute, 2014).

4. Insulator

Increasing the building insulation rate will reduce the building energy consumption, but on the other hand, the initial costs of the project will increase. On the other hand, if the energy consumption in the building increases, it is necessary to use larger solar systems for compensating this increase in energy consumption, which will result in an increase in the project initial costs. Therefore, by finding an optimal point for the building insulation rate, in which the maximum saving in energy consumption is achieved with the lowest initial cost, can determine the required insulation rate. Also, it is necessary to consider the insulation rate up to some extent in which the building construction process can have implemented capability. In the Materials Research Institute zero energy building, the insulating of the building has been selected in a way that the thermal power factor has been improved by 40% compared to the requirements of topic 19. (http://zero-energy.ir/index.php).

Table 1 Review of case sample

Performance	Solution	Form	Case sample
Supply the required power for a specific use Shading and absorption of sun heat Reducing the temperature due to the radiant heat absorption and preventing of heat transfer Using natural daylight and reducing the use of artificial light on the roof for energy conversion Reducing light reflection and sun heat absorption	Solar Panels Canopy and covered corridors green roof green wall Light shelves Photovoltaic technology Electro chromic glasses Air conditioning sensors Roof lights Roof chimneys	Elongated rectangular cube Curved roof Locating the building in shadow	BCA Academy Singapore  
Trapping heat and transferring it to the outside Evaporative cooling in the site by water and wind conduction Life cycle review Natural ventilation Solar energy absorption and energy conversion Cold and heat recovery from outlet air Reducing the air exchange rate Supplying heating energy	Atrium Outdoor wind chimes Materials Windbreaker Solar panels chiller Fan coil + sensor Photovoltaic and solar water heater	Angled orientation for shading Skin façade design	Masdar Institute, UAE  

5. Conclusion

One of the techniques for reaching the ultimate purpose of building designing and that, besides building beautiful designs and modern architecture, culture, and the need for adequate energy to reduce the cost of maintaining the air by slow degrees of fuzz and sympathy, that has been told to maintain the main purpose. As it was pointed out, building is one of the largest parts of energy - consuming in most communities. attention to the slight improvements in the building, to the accompaniment of energy and mechanisms, can have a very effective quantity in this sense.

This is noted that high energy use does not at all mean convenience in the building. The discomforts of life returning to the building with the mechanical equipment of its money supply and heat. The building that the aerobic system exists and contains higher energy, far more dissatisfied with the buildings without air. So, in many cases we use the building that can't raise a few times over, despite how much energy we have.

Studies conducted by braker, 1996, show that the usual teaching factors increased energy to 10 times more. The architect part of the building can increase the average cost from two to five times the normal use. if we add electric and mechanical plants, the amount will increase to twice the normal use. the remainder of the ten times as large as 2. At first glance it worried you that the architect was involved with the engineers and the people. There are two acceptable reasons why one of the architect's strategic decisions is important to the building. In the first place, they are closely connected with a building that is very rare. It can only happen if the building is completely replaced. The management should be able to encourage people to improve energy. Secondly, that the grand trio were not operating apart, and that the great - scale strategy of building energy was used to design the structure and depend on the behavior of the building. Apart from decisions that are used in architecture as a means to create energy, it is also a renewable energy, and, indeed, much of it is devoted to the never renewed energy that comes from fossil fuels, to use the deactivated systems by means of architecture, and to create environmental conditions

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Ecological Survey of Urban Plaza to Maintain and Improve Energy Consumption Management in Architecture

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Abstract

The purpose of this research is to investigate the ecological aspects of urban plazas in order to improve energy management and preserve it in architecture. The research method in this study is descriptive-analytical. In the descriptive part of the research, the subject literature related to the urban plaza and the ecological approach has been discussed. In the analytical part, first, 47 ecological criteria effective in promoting energy management in the urban plaza have been identified and then sent to experts and analyzed through the Delphi method. In the third stage, according to the results of the Delphi method, using the structural analysis method and Mic Mac software, 21 influential factors were identified and then the driving forces were extracted. The results include 5 decisive and influential driving forces including: symmetry and closeness of nature with human habitat with a weight of 653, use of renewable energy with a weight of 588, protection of landscapes with a weight of 588, integration of architecture and green space with a weight of 571 and the use of ecological materials with a weight of 555 are directly effective on improving energy management using ecological criteria. Also, 6 risk driving forces include: energy management with a weight of 641, thermal insulation with a weight of 581, use of smart systems with a weight of 577, use of solar energy with a weight of 556 and efficiency in the use of clean energy with a weight of 550 They are indirectly effective on the conditions of the plaza to improve energy management through ecological criteria. In fact, for energy management in urban plazas with an ecological approach, 5 main driving forces should be considered in locating and designing

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the plaza, and 6 risk driving forces should be considered as secondary factors. According to the results of the system analysis, it can be said that the way the variables are distributed in the scatter plane indicates the instability of the system.
Keywords: Plaza Architecture; Energy Management; Ecological Criteria

1. Introduction

As public and central spaces in cities, urban plazas play an important role in social life and urban activities. The ecological survey of the urban plaza in order to improve energy management and preserve the environment can lead to the improvement and optimization of these spaces. By designing and implementing urban plazas with a focus on ecological principles, it is possible to learn how to optimally use energy from natural sources such as sunlight and wind, reduce energy consumption for lighting, heating and cooling plaza spaces, use clean and renewable energy sources such as solar panels and Solar energy production systems, optimization of water use and proper waste management. Energy efficiency (EE) can potentially enhance socio-economic growth and promote sustainable development, which is a prerequisite for gaining competitive advantage in today's business environment (Caiado et al., 2017). This significant increase in demand for energy efficiency can be attributed to the rapid growth of the construction and ancillary services sector and the increased demand for suitable living conditions and new products (Zhang, Shen and Wu, 2011).

Sustainable management of natural resources and urban green spaces creates an important challenge with the continued expansion of cities. Urban green spaces, including parks, gardens, and trees, play a vital role in providing ecosystem services such as air purification, microclimate regulation, noise reduction, and opportunities for recreation and social interaction (Guo, Zeng, and Lee, 2023; Ban et al., 2023).

The ecological review of urban plazas includes the evaluation of the design of green spaces, the use of green construction materials and technologies, the provision of clean energy sources and energy management during the life of the plaza, the evaluation of the environmental and social effects of these spaces and their impact on the quality of life of citizens. By examining the ecology of urban plazas and providing suitable solutions, it is possible to try to perform more optimal energy management in these spaces and reduce the harmful effects on the environment. Also, creating ecological urban plazas can help improve the quality of life of citizens and create green and sustainable spaces in cities.

Based on this, the present study was formed with the aim of ecological survey of the urban plaza in order to improve energy management and preserve it in architecture, which can answer the following questions:

- What indicators are effective in the ecological review and promotion of energy management of the urban plaza?
- How to improve the energy management of the urban plaza through ecological indicators?

2. Theoretical Foundations

2.1. Ecological Design

As one of the branches of ecological design, ecological architecture focuses on environmental effects and sustainable development. The main approach of ecological architecture is to simultaneously identify the organism and the environment while examining the relationships between the two; Because the environment itself has standards that disrupting its balance minimizes

the chance of survival of various animal and plant species. Therefore, ecological architecture, which today is generally under the title of sustainable architecture, can significantly reduce the destruction of the environment (Asghari, 2010).

Ecology is the study of the distribution of microorganisms or a group of organisms in an environment and is usually mistakenly used synonymously with natural environment or environmentalism; But in practice and in the field of design, ecological design means the integration of artificial biological systems with natural and human systems. In other words, ecological design is the use of ecological design principles and strategies for designing the artificial environment and lifestyle so that they are integrated, harmless and compatible with nature, which includes the biosphere (Mahdian, Abroosh, and Heydari, 2022). In fact, ecological design is peaceful design with nature. The goal of ecological design is to design to integrate the environment without harming it. Some designers equate green design with ecological design. The design that has the least impact on the environment. In ecological design, design processes can be compared based on the structure of a tree that produces oxygen, uses solar energy, and purifies water. With all these results, these designs have problems in integrating with the natural environment. One of the solutions to consider design is the shaping of matter and energy and the process of achieving needs with specific demands. It is a detailed design that connects culture and nature through the exchange of matter, energy flow, and the choice of land use. The relationship between ecology and design is a very close relationship and has a series of unpredictable complications. Ecology explains how the natural world is global and how it behaves, and design is a key intervention point for sustainability in ecology. Ecological thinking about design is a way to strengthen the connection between nature and culture. Ecological design is any form of architecture that minimizes harmful environmental effects through integration with living processes. This integration means that the design respects species diversity, minimizes resource depletion, maintains nutrient and water cycles, and protects habitat quality (Zohari, 2019).

Ecological design is a framework for unifying traditional views on design and management with environmental views, taking into account ecological considerations in spatial and temporal scales. In fact, ecological design is a comprehensive and ecologically responsive design. Ecological design as a means of modeling the processes and functions of creating and designing an urban plaza based on the ecological approach in the field of energy utilization and optimization has many benefits, which are stated in the following Table 1.

Table 1 Design methods based on the ecological approach and its benefits in energy management

Method Hi Designingo nbasis Ecological approach	**From through**	**Benefits Designing On Basis Approach ecological**
synchronized to be w ith n ature and Climate	Ventilation normal, direction get suitable for openings, lighting Appropriate, Form environmental	cooling And Heating without interest get From System Hi mechanical
Application References Blue	Total Bring Water Rain And Recycle Sewage water	fixed Become a part From Need Water consumption At Building To wATERING systems And Wash
Use From Ecological materials	Materials canvas brought able Recycle and smart	Increase Interest Veri From Energy Hi clean and Absence Contamination Environment
merge architecture And space Green	Creation roof Green, view Green And Increase space Green On Roy the earth	Shadow launch, keep Building From Sun radiation, Decrease And adjustment temperature And humidity
- Interest get From	change angles Shadow Ban I see,	the maximum Y maintenance Energy

System Hi smart	Network high air And Control Lighting With Changes outside environment	And The lowest amount Waste to go it
Use From Energy Hi Reproducible	System Hi Interest get From Energy clean Najir cell solar And Turbine the wind	fixed Become a part From Need Building energy

2.2. Features of Urban Plaza

The history of the construction of open spaces in the world dates back to more than a century ago, and today there is a building called a plaza in most of the world's cities. In ancient Iran, the important urban squares in the fabric, as vast open spaces that had a more or less defined area, included communication, social, commercial, sports, military or a combination of two or more mentioned functions. And in general, they created a space for the general gathering of citizens, or in other words, a "plaza", such as Naqsh Jahan Square in Isfahan, Imam (Topkhana) Square in Tehran, Amir Chakhmaq Square in Yazd, each of which is located in a prominent and busy urban location. have been placed so that the public has easy access to it. On the other hand, in some cities such as: Old Tehran, Nain, Kashan and Yazd, local squares and takiyehs and hosseiniyehs have functioned similar to urban plazas, which function as small communication squares in residential neighborhoods. They did that in a place that was defined as a landmark and the center of the neighborhood to be used by all the residents (Soltanzadeh, 2019).

In contemporary cities, a plaza is defined as a square formed next to a thoroughfare, which is often in the form of a U-shaped spatial opening, and commercial, administrative, or cultural buildings are placed around it, generally attracts the public. Because the main function of a plaza, in addition to the same function as its neighboring uses, is defined as a social open space so that it can be used as a place for cultural events, such as various celebrations and public ceremonies, and on the other hand Due to its flexible use as an active urban space, it can accept other uses in accordance with the way citizens function in this place, and in other words, it can be transformed into a public space as a collective hangout. Certainly, the implementation of some cultural programs will be effective in increasing the city's dynamism.

2.3. Criteria for Locating and Designing the Urban Plaza

Locating and designing urban plazas play an important role in creating attractive and dynamic public spaces in cities. Below are some basic criteria for locating and designing urban plazas:

Central location: Plazas should be located in places that are known as attractive and highly used centers in the city. The central location of the Plaza means that it is located in an area with many commercial, cultural and social activities.

Easy access: Plazas should be easily accessible. They should be located near public transport stations and have good access to walking and cycling facilities. Also, they should be easily accessible from public roads and main streets of the city.

Appropriate area and dimensions: Plazas must have enough area to accommodate various activities. The dimensions of the plaza should be such that it facilitates pedestrian traffic and the use of public space.

Spatial diversity: Plazas should have spatial diversity in order to meet the different needs and interests of citizens. It includes green spaces, open spaces, covered spaces, rest areas, children's play areas and sports facilities.

Facilities and services: Plazas must provide the necessary facilities and services for citizens. This includes public tables and chairs, water fountains, sanitary facilities, sports facilities, service stations, restaurants and spaces for cultural events and activities.

Attractive design: Plazas should attract citizens with an attractive and beautiful design. Appropriate design of green spaces, use of beautiful architectural elements, appropriate lighting, and use of sound effects and mobility experiences in the design of plazas can increase their attractiveness.

Security: It is very important to create a sense of security in the plazas. Necessary measures should be taken to increase security, such as installing CCTV cameras, proper lighting at night, proper design with an approach to responding to crimes, and creating sustainable movement and activity in the plaza.

Environmental sustainability: The design of plazas should pay attention to environmental sustainability. The use of less consumption of water resources, renewable energy, containment and recycling of pollutants and the use of recyclable materials in structures and equipment can help the sustainability of plazas.

Public participation: In the design of plazas, the participation of citizens and local stakeholders is very valuable. Appropriate opportunities should be provided for people's participation in the process of designing and making decisions regarding the needs and decoration of plazas.

In Table 2, the design elements in locating the urban plaza along with its conditions are presented:

Table 2 Design recommendations for a successful urban plaza

Design elements	Explanation	
Location	The location of a plaza in a city block can also affect the type of space. The location at the corner of two intersecting streets, which are almost at the same arterial level, allows the plaza to be an active place for meetings, a space for passing and watching passers-by.	
Size and size	Kevin Lynch commented that the 12-meter dimensions seem meaningful in terms of scale. These dimensions up to 25 meters are still a desirable human scale, and most of the old enclosed fields did not exceed 140 meters in their smallest dimension (Lynch, 2019).	
Visual complexity and diversity	The plazas that received a high score from the citizens have positive points such as: shape, color and texture, various landscape elements, trees, bushes, fountains and statues, various .artificial products, articulation of the space, corners, angles and secluded and cozy places.	
Applications and activities	**Passers-by pause**	It is most used in wider plazas and in those that help shorten the path. Plazas that do not basically act as a passage, make the audience stay in them longer (Pushkarev and Zupan, 2018).
	Male and female contacts	Often, men are more inclined to use urban open spaces, especially downtown plazas, and the number of women who use the plazas in groups or in pairs is more than men.
	Homeless and awkward people	Investors agree that plazas are organized and planned to meet the needs of users, customers, and retailers, and if they can attract certain segments of the population, while excluding other groups such as: the homeless, the poor, noisy children, street vagrants, etc. away, they will succeed (Loukaitou and Banerjee, 2013).
Service area	When designing a new urban plaza, its general use should be considered first, and then who are its real audiences. This point includes considering where these contacts will come from and what route they will take to use the plaza.	
Climate	**Sun radiation**	The plaza should be located in a place that has maximum sunlight in summer and winter. In the parts of the country that have very hot summers, the shade in the summer is desirable at least in a part of the plaza, and this shade can be provided by nearby flowers and plants.
	temperature	When the air temperature is above 14 degrees Celsius, the amount of recreation such as: walking, standing, sitting in urban plazas increases significantly. Therefore, when locating seating areas, optimal sunny environments in the evening hours and "sun-shade" patterns should be

		considered for months when the average evening temperature is 14 degrees or more.
	Reflection of the sun is disgusting	Because the surface of the plazas is covered with polished materials and also surrounded by the reflective surfaces of the surrounding buildings. In areas where most days are rainy and cloudy, dark surfaces also cause the space to be dark and depressing.
	Wind	The negative effect of wind will be significant when the air temperature is not enough to sit outdoors or when most outdoor spaces do not have direct sunlight. For the audience, being exposed to strong wind (when the condition of clothes or hair is messed up) is an undesirable thing, even though this wind does not cause the air to get cold.
Borders and crossings	A plaza should be visible and functionally accessible to passers-by, and at the same time be understood as a separate place.	
Circulation and movement	Plazas should be able to organize three categories of "movement patterns": a) passing through it; People use public plazas as shortcuts or pleasant walking paths. b) Access to restaurants, banks or other shops around the plaza. c) access to sitting platforms or viewing spaces; People enter the plaza to sit in the sun, eat lunch, see a show or listen to a concert.	
Planting plants	The variety and quality of texture, color, material, volume, ambient sound and the effects of the sense of smell created by a detailed plant planting plan can greatly increase the use of the plaza. The smaller the plaza, the more semi-dense trees in terms of branches and leaves or needle leaves.	
Level difference	The level difference can have important visual, functional and psychological consequences. For most visitors, plazas with significant level differences are more attractive than completely flat plazas without level differences. These types of plazas also have functional advantages.	
Fountain	The sound of falling water reduces stress. In a dense urban structure, a fountain should be designed in such a way that it creates the sound of falling water as much as possible and places are provided so that those who wish can sit and make the most of the sound of water.	
Flooring	People look for a direct and shorter route in their relocations, this principle should be observed in all main traffic routes; Otherwise, people take a shortcut on grass or plants to reach their destination as soon as possible.	

Source: Marcus and Francis, 2014

3. Research Method

This research has an applied nature and the descriptive and analytical method, the analysis method and logical reasoning, which is based on the structural analysis method, has been used. Mic Mac software was used to analyze the data. The interaction analysis method or the cross-over effect analysis method is an efficient and useful approach. Interaction analysis is a method for identifying mutual relationships. So that the influence of each trend on other trends is graded. In other words, CIA is a semi-quantitative method in which, instead of simple cause-effect relationships, interrelationships between different subsystems are analyzed in a matrix. In order to identify the indicators and evaluate them, the Delphi method and interviews were used to obtain the opinions of decision makers and experts. The statistical population for carrying out the Delphi model was selected through purposive sampling, which includes 15 experts: PhD in architecture (Mohammed Ayeni), PhD in urban planning (Vahid Yusuf Vand), PhD in environment (Maryam Mohtsham), PhD in urban management (Taher Parizadi), Construction Technology Engineering (Mohdi Rahimi), Ph.D. in Civil Engineering (Sabir Ahmadi), Ph.D. He is an expert in the field of municipal urban planning (Zahra Drodian), a doctorate in tourism (Amanj Rasouli), a doctorate in sociology (Yasin Wahabi) and a doctorate in civil engineering (Syed Mehdi Mahmoudi). In the descriptive part of the research, the subject literature related to the urban plaza and the ecological approach has been discussed. In the analytical part, first, 47 ecological criteria effective in promoting energy management in the urban plaza have been identified and then sent to experts and analyzed through

the Delphi method. In the third stage, according to the results of the Delphi method, using the structural analysis method and Mic Mac software, 21 influential factors were identified and then the driving forces were extracted.

4. Research Findings

In order to evaluate the criteria and analyze the data, experts and specialists in the field of ecological architecture were identified through the Delphi method through targeted sampling and semi-structured interviews, and the sample size was determined through theoretical saturation. In order to achieve the goals, 15 interviews have been prepared and analyzed in MikMak software. Based on this, the following table presents the ecological criteria of the urban plaza in order to improve energy management and preserve it in architecture:

Table 3 Ecological criteria of urban plaza architecture

Row	Criterion	Row	Criterion	Row	Criterion
1	synchronized to be With Nature And Climate	17	scale human	32	Attention To Better Designing environmental
2	adjustment Water conditions And by air	18	Interest Veri in use of clean energy	33	Decrease Effect heating Environment
3	Responsibility adaptability ecological	19	Lush And life acceptable	34	supply the light Appropriate
4	Decrease Energy and material consumption	20	protection from the eye sizes	35	Use From Materials And Materials native
5	symmetry And Proximity Nature With habitat human	21	Creation Sights Economic Stable	36	Materials With level Degree runaway little
6	keep Corridors Green And Axes Green	21	keep Variety biological	37	Thermal insulation
7	Application References Blue	22	the balance And Performance	38	Level shading
8	Use From Energy solar	23	Program Hi Compatible With Environment life	39	Continuity Spatial
9	Use From Ecological materials	24	sustainability operational	40	comfort environmental
10	merge architecture And space Green	25	access And Permeable Y	41	comfort thermal
11	Interest get From System Smart ones	26	Organizing the waters Y Superficial And Water Rain and use e again From it	42	Energy Management
12	Use From Energy Hi Reproducible	27	Continuity Network ecological	43	line the sky
13	keep Energy And References normal	28	current weather clear	44	sex and the color of the materials
14	Health References Blue	29	Reduction of islands thermal	45	Proportions And Discipline
15	Control types of pollution	30	Corridors current Water And current Air	46	Variety physical
16	orientation	31	Attention To Posh herbal		

In the first stage, a number of 47 criteria were sent to the experts and specialists, and after receiving the answers, the following 21 criteria were identified as the main factors affecting the promotion of energy management in the urban plaza based on the ecological approach:

Table 4 Main factors affecting the promotion of energy management in the urban plaza based on the ecological approach from the experts' point of view

Row	Criterion	Row	Criterion	Row	Criterion
1	synchronized to be With Nature And Climate	8	symmetry And Proximity Nature With habitat human	15	Use From Ecological materials
2	Interest Veri in use of clean energy	9	Materials With level Degree runaway little	16	comfort environmental
3	Decrease Effect heating Environment	10	keep Corridors Green And Axes Green	17	merge architecture And space Green
4	supply the light Appropriate	11	Thermal insulation	18	comfort thermal
5	protection from the eye sizes	12	Use From Energy solar	19	Interest get From System Smart ones
6	Use From Materials And Materials native	13	Program Hi Compatible With Environment life	20	Energy Management
7	keep Energy And References normal	14	Reduction of islands thermal	21	Use From Energy Hi Reproducible

4.1. Evaluating the Effectiveness and Impact of the Variables

In order to evaluate the influence of variables and their influence on each other, the cross-matrix method was used. In the cross matrix, the sum of the row numbers of each variable is the degree of influence and the sum of the columns of each variable also shows the degree of influence of that variable from other variables. Based on the analytical results of this matrix, indicators of being in sync with nature and climate, thermal insulation, energy management, use of solar energy, use of smart systems are among the indicators whose degree of influence is much higher than their degree of influence and most indicators of the aforementioned groups alone also have a high degree of influence in the system.

In contrast to the indicators of conservation of energy and natural resources, reduction of heat islands, environmental comfort and protection of landscapes can be considered as influential groups, although the dispersion of influence - influence within each group is accompanied by fluctuation, but in total they can be Dependent variables are known as influential.

4.2. System Environment Analysis

The distribution of the variables in the dispersion plane indicates the level of stability or instability of the system. In the methodology and analysis section of MikMak, two types of distribution are defined, which are known as stable systems and unstable systems. In stable systems, the distribution of variables is in the form of English L, which means that some variables have high influence and some have high influence. In stable systems, the sum of three categories of variables can be seen:

A: Variables highly influencing the system (key factors)

B: independent variables

C: system output variables (result variables).

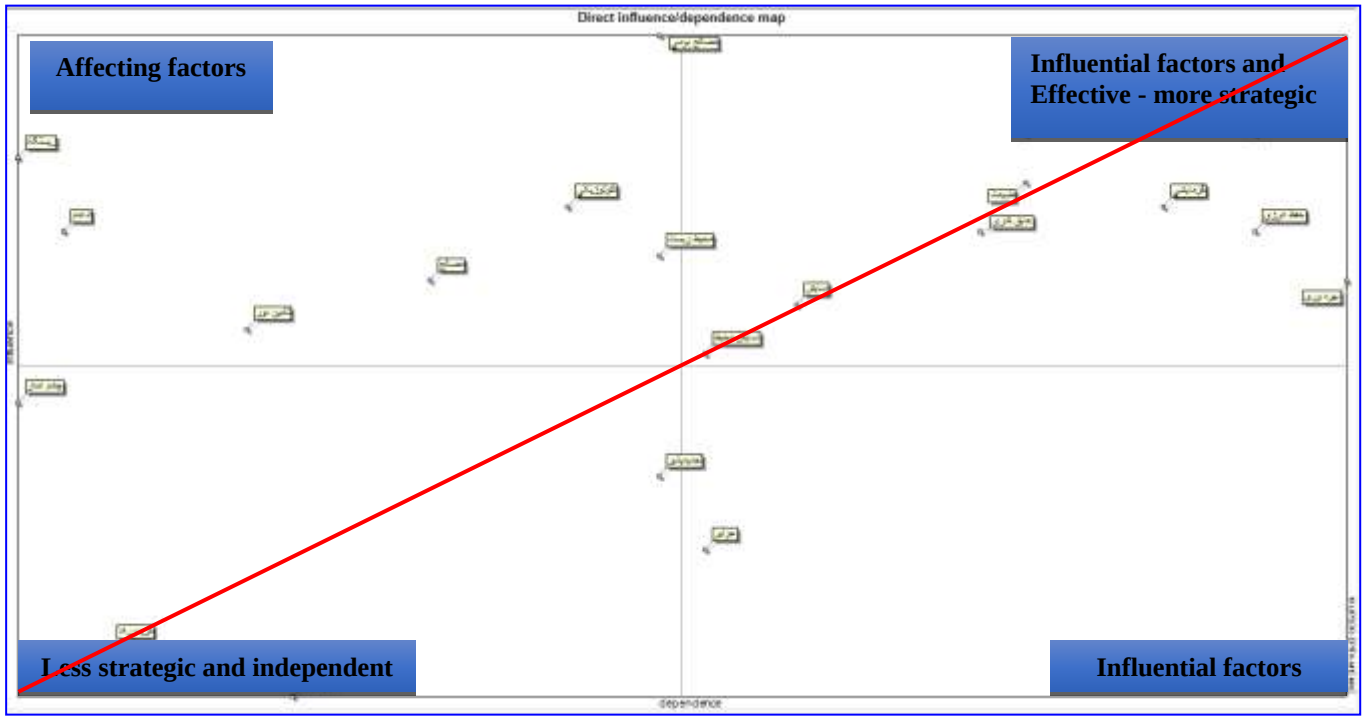

Fig 1 Map of the distribution of forces and their position in the axis of influence - influenceability

In this system, the position of each factor is clearly defined and its role can be presented clearly. On the other hand, in unstable systems, the situation is more complicated than in stable systems. In this system, the variables are scattered around the diagonal axis of the screen, and the variables often show an intermediate state of influence and effectiveness, which makes it very difficult to evaluate and identify key factors. However, in this system, ways have been drawn that can be a guide for selecting and identifying key factors (Godet, 2003). What can be understood from the state of the scatter plot of the influencing variables on the improvement of energy management in the urban plaza based on the ecological approach is the very severe instability of the system. Most of the variables are scattered around the diagonal axis of the plane, except for a few limited factors that show that they have a high influence on the system, the rest of the variables have almost the same situation with each other, only their intensity and weakness are different. In the scatterplot analysis of the variables of improving energy management in the urban plaza based on the ecological approach, the following variables can be identified in the system:

Determining or influencing driving forces: Considering the identification of the system as an unstable system, the presence of high-level influencing factors at the far end of the diagram in the northwest side seems unlikely because this place has more variables in stable systems with However, several factors are shown near this area, which indicates their ability to have a large impact on the entire system:

Table 5 Determining or influencing driving forces

Row	Factor
1	symmetry And Proximity Nature With habitat human

2	Use From Energy Hi Reproducible
3	protection from the eye sizes
4	merge architecture And space Green
5	Use From Ecological materials

Bidirectional driving forces: these variables have two common characteristics of high influence and high influence, and any action on these variables will cause a reaction and change on other variables. These variables can be divided into two groups: risk variables and target variables. Out of the total of 21 variables, 6 variables are in this group. Two-dimensional variables are divided into two categories: risk variables and target variables:

Table 6 Risk driving forces

Row	Factor	Row	Factor
1	synchronized to be With Nature And Climate	4	Energy Management
2	Thermal insulation	5	Using smart systems
3	Use From Energy solar	6	Interest Veri in use of clean energy

According to the results of the Delphi model and the structural analysis presented in the table below, 5 decisive and influential driving forces include: symmetry and closeness of nature with human habitat with a weight of 653, use of renewable energy with a weight of 588, eye protection Dimensions with a weight of 588, integration of architecture and green space with a weight of 571, and the use of ecological materials with a weight of 555 are directly effective on the promotion of energy management using ecological criteria.

Also, 6 risk driving forces include: energy management with a weight of 641, thermal insulation with a weight of 581, use of smart systems with a weight of 577, use of solar energy with a weight of 556 and efficiency in the use of clean energy with a weight of 550 They are indirectly effective on the conditions of the plaza to improve energy management through ecological criteria. In fact, for energy management in urban plazas with an ecological approach, 5 main driving forces should be considered in locating and designing the plaza, and 6 risk driving forces should be considered as secondary factors.

Table 7 Rank and weight of direct and indirect effects of forces

rank	Variable	direct effect	Variable	Direct dependency	Variable	Indirect impact	Variable	Indirect dependency
1	Symmetry and closeness of nature with human life	653	Interest Very in use of clean energy	718	Energy Management	641	protection from the eye sizes	706
2	Use of renewable energies	588	keep Energy And References normal	686	Thermal insulation	581	merge architectur e And space Green	704
3	Protection of visions	588	Energy Managemen t	686	Use From Energy solar	577	Materials With level Degree runaway little	696
4	Integration of architecture and	571	Decrease Effect	653	Interest get From System	556	Program Hi	658

rank	Variable	direct effect	Variable	Direct dependency	Variable	Indirect impact	Variable	Indirect dependency
	green space		heating Environment		Smart ones		Compatible With Environment life	
5	Use of ecological materials	555	synchronized to be With Nature And Climate	604	Interest Veri in use of clean energy	550	Use From Energy Hi Reproducible	617

The diagram below shows the relationships between the driving forces effective in promoting energy management using ecological criteria. The red lines indicate the strong influence and the blue lines are the moderating forces.

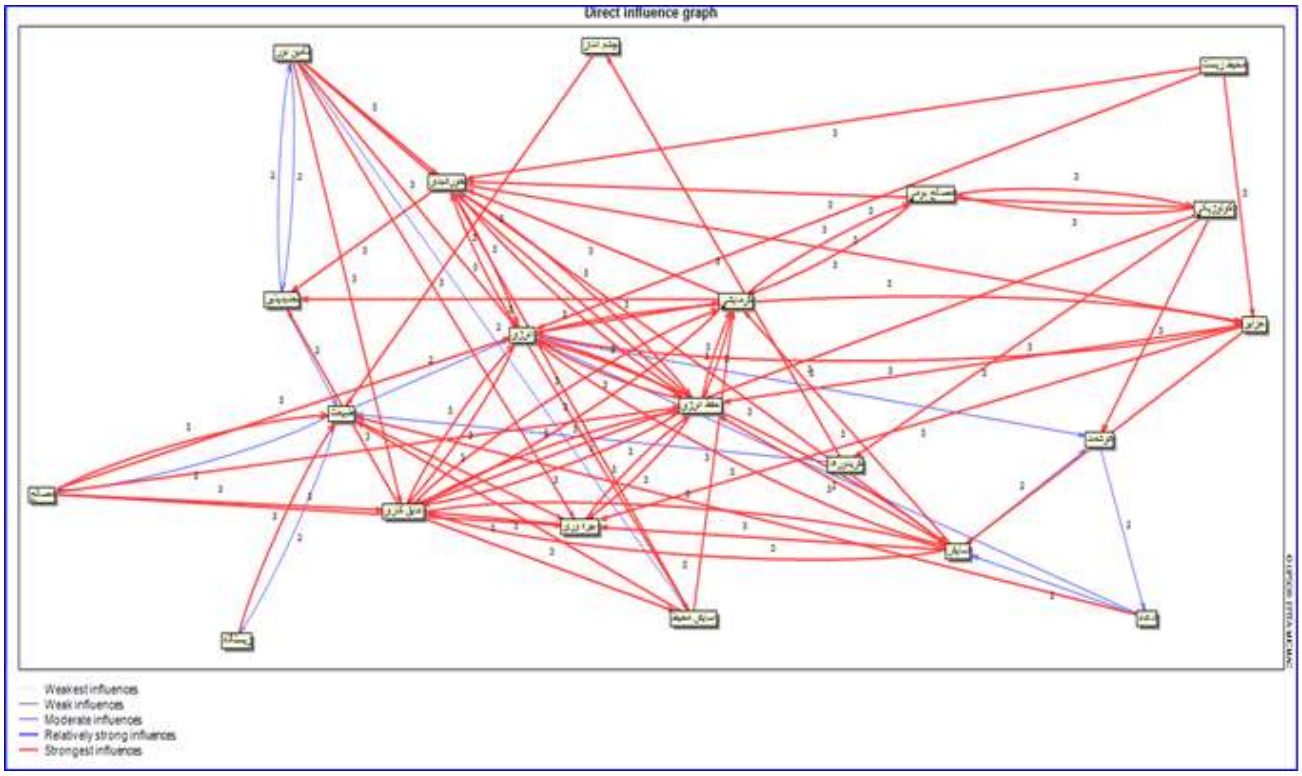

Fig 2 Rank and weight of direct and indirect effects of forces

5. Discussion and Conclusion

Ecological architecture is a method of design that places human-made structures in a healthy relationship with the natural environment and atmosphere, in a way that causes the least harm and danger to the ecosystem. The basis and centrality is also based on local and environmental characteristics. Architectural design according to ecological concepts is comprehensive and inclusive and defines the principles in ecological architecture. Solutions arise from the place itself. Ecological audit and information that reflects ecological benefits and losses are important for making design decisions. Also, natural forms and processes should be allowed to guide the design and can interfere in the formation of values and goals and change the perspective and method in architectural design. The new approach to green architecture that focuses on building design for

optimal use of energy and the use of recycled materials in building construction, architecture based on the characteristics and patterns of the shape of the land and paying attention to the native aspects of each place is one of the main concepts of application. Ecology is in architectural design, which has been developed in the foundations of architecture in the last two decades. The purpose of this research is to investigate the ecological aspects of urban plazas in order to improve energy management and preserve it in architecture. According to the results of the Delphi method, using the structural analysis method and Mic Mac software, 21 influential factors were identified and then the driving forces were extracted. The results include 5 decisive and influential driving forces including: symmetry and closeness of nature with human habitat, use of renewable energy, protection of landscapes, integration of architecture and green space, use of ecological materials and being in sync with nature and climate. Was obtained. Also, 6 risk driving forces were identified including: energy management, thermal insulation, use of smart systems, use of solar energy and efficiency in using clean energy. In fact, for energy management in urban plazas with an ecological approach, 5 main driving forces should be considered in locating and designing the plaza, and 6 risk driving forces should be considered as secondary factors. According to the results of the system analysis, it can be said that the way the variables are distributed in the scatter plane indicates the instability of the system.

According to the results of the research, it can be said that the ecological review of urban plazas in order to improve energy management and preserve it in architecture, can have significant improvements in this field. In the following, the important factors in the ecological review of urban plazas in order to manage energy and preserve it in architecture are presented:

Conceptual design: At first, it is necessary to address the conceptual design of plazas according to the principles of ecological architecture. This includes understanding local needs and patterns, using local resources, integrating with the environment and green spaces, using environmentally friendly materials and renewable energies.

Utilization of solar energy: Using solar panels to generate energy in urban plazas can be a sustainable and renewable source. This energy can be used for lighting, heating and cooling systems, charging electronic devices and other energy needs.

Using smart systems: Installing smart systems to control the optimal use of energy in urban plazas can help energy management. These systems can include automatic lighting control, heating and cooling systems, lighting timing and other energy consuming equipment.

Green space: Creating green space and using plants in urban plazas, in addition to improving beauty and connection with nature, can play an important role in energy management. Plants cool the environment, produce shade, absorb polluted gases and increase air quality.

The use of ecological materials: the use of recycled and environmentally friendly materials in the structures of urban plazas can be related to the preservation of natural resources and the reduction of harmful effects. This includes the use of recycled materials such as recycled wood, recycled stone, recyclable metals and green materials such as recycled concrete and Portland cement.

Water consumption management: In the design of urban plazas, water consumption management should also be considered. Using rainwater collection and reuse systems, using smart irrigation systems and reducing water leakage in plaza structures can save water consumption.

Education and information: For optimal energy management in urban plazas, education and information to residents and users of plazas is of great importance. People's awareness of energy saving methods, optimal use of existing equipment and tools, and encouraging sustainable behaviors can help reduce energy consumption and maintain it.

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