Explaining the Role of Light in Quality of the Architectural Spaces in Iranian Mosques

Fariba Alborzi[a] , Farah Habib[b]*, Iraj Etessam [c]

[a]Ph.D., Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran
[b]Professor, Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran
[c]Professor, Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran

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Abstract

The research analyses the essence and relationships between the variables in the context of light and architecture, and aims to develop the knowledge and design based on the light and recognition of the space, an effort was made to analyze the role of light in quality of the Iranian architecture and three samples of the most precious mosques were selected as the instances of this phenomenon, eg., *Nasir-Al-Molk* Mosque in Shiraz, *Sheikh Lotf-Allah* Mosque in Isfahan and *Vakil* Mosque in Shiraz. Light processing has different specifications in each of the mentioned mosques, as it is applied in a specific way which deserves consideration and it represented a number of considerable beautiful aspects. According to the valuable role of light on definition and interpretation of the space, it is assumed that: light has a great value in the quality of the spaces in the architecture of Iranian mosques and the fact it plays an effective role in enhancing the "quality" of the architectural space and to improve the "spatial quality and value", and it was employed to induct the concepts including "movement", "stillness", "calmness" and "silence", "sanctity", "focus", "attention", "passion and excitement", "clarity", "ambiguity", "sequence", "guidance", "routing", "inviting", "reflection", "beauty" and "esthetic" of the architectural space, developing a sense of "memorability" of the architectural space, "vitality" and "dynamism" of the space, "semanticization" of the architectural space, inducting a "special sense and spirit to the space", and "spiritual" characteristics to space, heightening the "sense of spirituality", creating "immaterial space", shaping the sense of "movement", "continuity of path", "continuity of movement and routing", "light and shadow in the path", and "internal space essence change", "Spatial perception", inducting the "sense of place", "sense of time", "sense of belonging", "identification", and shaping the "sense of presence", "contemplation" and "persistence" of people in the space. In the research hypethesis, light is the independent variable and quality of architectural space and concepts are the dependent variables. The research is done with a descriptive-survey method and the data was analyzed by SPSS 18, the results are presented in the form of charts and tables.

Keywords: Light, Quality of Architectural Space, Iranian Mosques, *Nasir-Al-Molk* Mosque in Shiraz, *Sheikh Lotf-Allah* Mosque in Isfahan, *Vakil* Mosque in Shiraz.

1. Introduction

It's very complicated to talk about light since it is a very tangible element; many people have elaborated on this subject and yet there are a lot to say. It has a more important and sensitive role in the architecture in addition to its effects on human lives, an artistic combination of light with the architecture causes a sense of elevation on the quality of architecture. This can put this way: the vision, best said eyesight is the very first that perceives the light; it is also one of the most senses of human being in the both intellectual and sensory perception of the architecture, the human eye includes a number of readings from the environment. "Visual environmental sense causes the enrichment in the architecture" (Pallasmaa, 2012: 11). The more the beauties and wonders of light increases in one's mind, there would be a more focus on the sense of place which would create a better image of the type of architecture in the mind of the visitor. Meaningful events are experienced in places (Partovi, 2013: 71) and we can dare to utter that light is one of the impactful factors in creating meaningful events "We can call the sense of place as the sense of belonging to the space and the sense of continuity" (Partovi, 2013: 123), this "sense of place" leaves an unforgettable feeling on the mind. The interpretations which are formed based on the human recognition, sensory recognitions, memory and the spatial recognitions which are shaped in a space leave a persistent image of the architecture in the mind of the observer, images, places and spaces are formed in the human mind and remind the persistent architectural spaces as a spatial experience, those images which has a more focus on the memorability of the space has a more bold role among all other images, places and spaces. Task of the architecture is to employ tools that can symbolize and eternalize these aspects, the optical behavior in the architecture are among the factors which memorize the building by its optical and color specifications and provides an opportunity for paying attention and have illustrations of the building lights. Developing spatial boundaries is one of the other functions of light which are separated hierarchically with the use of light; the hierarchy of sensory recognition has a

* Corresponding Author Email: f.habib@srbiau.ac.ir
faalborzi@yahoo.com

direct relationship with the amount of light that shine on the space. Different notions are crystallized in the mind of the visitor while passing through the spaces with different intensities in the lighting. Spatial recognition and experience has a bold role in picturing a memorable scene in the space, the light and colors represent for architecture (Figure 1). Rays of light bestow values to the architecture and provides an opportunity to represent the new symbolic meanings of Iranian architecture.

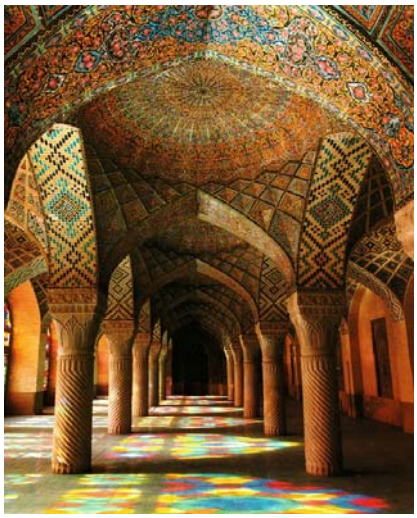

Fig. 1. Main *Shabestan* of *Nasir-Al-Molk* mosque in Shiraz (Source: Ziaeian,2012: 89)

2.Theoretical Framework

2.1 Light

If there exist a phenomenon or an object in the world which nothing can describes it, then itself should be manifest and evident, while there is nothing more evident than the light, so nothing is more independent from description than to light (Sohrevardi, 2010: 106). Light has an omnipresent role in the nature which is usually been interpreted as an evident phenomenon and the wonderful diversity caused by the light and the its effectiveness degree has a considerable extent (Gardner, 1995:18). Human perceives the light through the eye sight and its effect on the optical sensory nerves in our eyes (Seyed Sadr: 2005: 115). "The light from the skies is repeatedly changing although these changes are not tangible for the human eyes the movement of sun in the sky is the most important factor to the changes but the water particles (clouds), dust and air pollutions is also impactful" (Owens, 1998: 125). Light is as important for our recognition of the shapes that the forming material of the shape is" (Gardner 1995: 18). One of the duties of the light is to create contrast" (Gardner, 1995:18) (picture 2). Many things can be done with the light you can bend it, reflect it or decompose it into its forming colors (Ioa, 1997:201). In the way of using the light there is an artistic approach, the recognition of the space and environment change with changing the light (Grother, 1996: 449). One of the specifications of natural light is the change and fluctuations that it include that causes the architectural space to change accordingly and get different forms.

Lights cause certain feelings and senses in the human soul which is the same that to its qualitative, symbolic reality inside. Since light used to be always having a high level of importance in the Iranian architecture, a sense of color recognition and its concordances which has a direct relationship with the recognition and the role of the light has a pervasive effect on all the disciplines of Persian arts (Nasr, according to Ardalan Bakhtiar, 2001). "The most tangible element in the pictorial [visual] arts are the colors" (Mahmoodi Alemi, 2009: 22). Light and colors, together bring beauty with themselves. Aesthetic behavior is an ability to recognize things before the objects are there (Adorno, according to Grother, 1996: 93). Many of the forms have cultural and symbolic values beyond their probable functional values (Grother: 1995: 85). These symbols have a language for their own (Grohtherm, 1996: 85). Light has an important role on quality of the architectural space, and it is not irrelevant that Le Corbusier says: "Architecture is the masterly, correct and magnificent play of masses brought together in light. Our eyes are made to see forms in light; light and shade reveal these forms; cubes, cones, spheres, cylinders or pyramids are the great primary forms which light reveals to advantage. (Corbusier cited in Ander, 1995: 1)

Fig. 2. Main Shabestan of *Vakil* mosque in Shiraz (Source: Authors)

2.2 Light and Architecture

Light is the most significant specification of Iranian architecture, it is not regarded as this only as a material element but as a symbol of divine reason and also the divine presence. Light is a spiritual essence that can infiltrate into the density of each material and turns it into a noble, worthful form that is suitable for the living space of the human being's self. An essence which have existing roots in the world of lights (Nasr according to Ardalan Bakhtiar, 2001). Architecture offers a dramatic structure which goes through the substance, space and light. Architecture is the art of freezed silence (Pallasmaa, 2012: 64). In a notable architectural space, there exist a deep and permanent aroma of light and shadow. Shadow takes the light inside and the light brings it out (Pallasmaa, 2010:60). Spatial continuity is one of the other experiences that light and shadow create. A number of spaces that are shaped in their permanence and in the pure presence of light and shadow, it contribute to a new

articulation of spatial recognition. Architecture starts the actions and movements, guide and organize them (Pallasmaa: 2010: 76) and the way of processing light directs these actions and movements. Light make a great aid to represent and remind the architecture again. Light plays the role of a valuable semantic effect in addition to its operational function, it can semanticize the space. Different architectural aspects can be added to the architectural space with the use of light. Can indicate a spiritual place and gift the sense of spirituality to the building. It is possible to add to the quality, purity and the value of architectural space and picture the aspects of beauty in the architecture. Light has a significant role in quality of the Iranian architecture, and light is used to induct different sense of movement, stillness, peace and calmness, spirituality, beauty, focus, attention, liveliness and excitement, clarity, ambiguity, sequence, guiding, and reflection.Image of the glittering dots on the ground and their sequence has a focus on the concepts like movement, in the mosques, too, when the light glow from the apertures in the fund of the dome inside, it create different moods in different times of the day, in addition the lights bring their special different colors and and aspects to the space on different seasons and climate conditions. By using the light in the religious buildings we can add to the spiritual purity of the space and to have a focus on the forms and shapes with a specific focus and attention. Light can independently describe the space and separate an arena. We can use the light in order to reflect the concepts like movement, stillness, liveliness and excitement and focus. Maybe the main role which light have in the viewpoint of qualitative aspects, it is to breathe a soul to the body of architecture. The impactful approaches of lighting in the architecture of Iran can be analysed from the functional, semantic, cultural and aesthetic positions (Habib, et al, 2013). Color, describes the color, depth and space the better. It can offer other definition for the spaces and read the buildings in another way. “Interpretations and translations of the lights are in between that take it out from the quantitative boundaries and give them a proper identity which is at simultaneous, at once place, both qualitative and quantitative” (Falamaki, 2002: 312). Light brings a considerable quality to the space and brings the manifestation of material beyond the beauty in the glittering and charming rays of light. Light gives different shape to the objects on each moment. In an architectural space, light has impacts on various different factors like : quality of the space, use of the space, activities and the inhabitants.

2.3 Function of the light

Whatever comes to our eyes from the environmental daintinesses, roots from the rays of light and luminance; while they will not gain significance in the darkness. The true beauty is perceived with the light of wisdom and the seeming beauty is perceived with the sense of eyesight. Light and luminance, will makes the beauties more vivid to our eyes for us consider, whether it is superficial or a true beauty and will cause the colors, volume and other beauties of the object to be manifested (Kateb, 2011: 38). “Light has an influential essence and it can vitalize the space. Not many things are found which are relieving and soothing as the natural light rays in the building interior” (Egan, and Olgyay: 2011: 1). The presence of rays of light from the sun brings a special subtle feeling to the space and it makes the environment delightful” (Egen and Olgyay: 2011:1) (Figure 3).

Fig. 3. Shabestan of *Vakil* mosque
(Source: Authors)

Light plays different roles on the architecture, in which we can mention the functional, semantic and conceptual, symbolic and aesthetic roles (Alborzi, 2013).

Table1
Role of Light in Architecture

Light	Operational function
	Semantic and semanticization function
	Symbolic function
	Aesthetic function

"The most important factor in the convenience of vision is the suitable distribution of light. If the light has a improper distribution in a specific space and its intensity and dispersal has differences from one point to another, the inhabitants would not have a feeling of peace” (Heidary, 2010: 42). Size of the object, contrast and the luminance level of the reflected light from the object and the time of observation is one of the main factors in observing and quantitative evaluation of it (MortezaZadeh Dergheh, 2005: 194-195) and “the excess use of light in the field of the spectator’s view will lead to a weakness in the sense of vision” (Owens, 1995: 40). “Judging colors and the light intensity is the most important factors in the optical sense of human being. To recognize the situation in the space, watching a small highlighted image would be enough, but it also includes a number of limitations” (Grother, 1996: 488). Eye absorbs the light; and brain perceives the eyesight. (Bowa, 1997: 58). In other words, the light is the main creator of the world and a tool which the outside world os directly experienced (Gardener and Maloney: 2007: 15). No sign and symbol is not close to the unite

god as the light. This is why the Islamic artists try to use this factor to the most extent on their works (Burkhart: 1986: 88). The role of light in the Islamic architecture is the strict focus on the maxim of manifestation: (Bolkhari Ghahi, 2005: 509). On one hand by using the glaced textiles, avoids the fading of lights on the surface of the light, they reflect the light by smooth flat surfaces (or mirrors), surface which is a totally material concept take distance from its material essence by being subjected to the rays of light and specifically consolidate with their fully abstract figures of it (geometrical and herbal shapes) become an epiphany for the immaterial concept of the light in the house that is dubbed as the house of God the image of "Allah, as the light of earth and heavens" (Bolkhari Ghahi, 2005: 509-510). Islamic architectural spaces are combined together with artistic use of light and they form a unity which go beyond the ordinary "earthly" experience (Nasr, 1988: 54). Architecture brings a residential land to the human being and let him/ her to lead a poetic "being" which is the ultimate goal of architecture" (Norberg-Schulz: 2003: 78). Architecture starts the actions and movements, it guides and organizes them (Pallasmaa, 2012: 76.) Architecture is a spiritual order which is manifested in the Buildings (Holain according to Gruther, 1996: 54).

2.4 Light in the Iranian Mosques

Routing and creating a space with the high level of light develops specific spatial effects, the point that has a high application in the architecture of mosques in Iran. Mixture of light and form includes the space and this is an approach in making the space (Egan and Olgyay: 2011: 46). The scarcity of light was not a serious issue since the light should be glowing from the back on the people in a way that it was directed on the altar and the first praying person (Pope, 2004: 253). In *Sheikh Lotf-Allah* mosque, during the dawn and dusk when sun is close to the horizon, the sunlight will be first reflected on the ground of the mosque, then the golden rays of light climb the textiles on the wall where the light paints the textiles with a golden touch as the sun goes down.To visit this masterpiece, one should assist enough time and attention and should sit in a corner to see the play of light in it's most beautiful forms of it. The movement of sunlight, specially on the wall where it become visible as golden flowers is extra interesting and beautiful (NajmAbadi, 2002: 52). The lighting mechanism are based on four factors: Harnessing the light, refining it, reflection and absorbing the light, and adjusting the power of vision with the light (NajmAbadi, 2002, 32) (Figure 4). In the Hakim mosque is also a considerable case according to its attention on the light and shadows as a new different way of using the light, also the attention to the light and colors and the different spatial aspects in the *Nasir-Al-Molk* mosque deserve a significance.

3.Research Methodology

3.1 Research questions

- What is the role of light in quality of the architectural environment of mosques in Iran?
- Which senses and concepts are inducted by the use of light in the architecture of mosques in Iran?

Fig. 4. Shabestan of *Sheikh Lotf-Allah* mosque. (Source: Najm Abadi, 2002: 39)

3.2 Research assumptions

Among the proposed theories for the research, there was an effort to analyse the role of light in quality of the Iranian architecture and three models are selected as the instances - of valuable mosques in the Iranian architecture. A number of mosques - as the options - were subjected to discussion and consideration among different Iranian mosques, it was then appointed that the choices which that has an importance and relevance in the use of lighting should be discussed and analysed. In this deliberation, three mosques of *Nasir-Al-Molk* mosque in Shiraz, *Sheikh Lotf-Allah* mosque in Isfahan and *Vakil* mosque in Shiraz were selected. The processing of light has differences in each of the mosques which make them distinguished. What separates the *Nasir-Al-Molk* mosque from others is the light processing which is done in a special and motivational way and have reflected a representation of beauty. The mosques are regularly build in a way that the light shines from the backside while it radiates from the left ward which makes a good sense and feeling by reflecting lights to the interior spaces of the mosque. The lighting design in *Sheikh Lotf-Allah* is in a way which underscores sustainability in the mind of the visitors. In the Hakim mosque, deep shadows and the shining of light from the backside have developed a different space which has an emphasis on the sense of spirituality in the space. According to the valuable role of light in describing and interpreting the space, the following hypotheses were delineated:

- Light has a significant role in "quality" of the architectural space of mosques in Iran, it also have a bold role on elevating the "quality" of the architectural space and the "quality and the spatial value" in this context.

- In the persian architecture, light is used to induct the senses of “movement”, “calmness”, “peace”, “silence”, “holiness”, “focus”, “attention” liveliness and excitement”, “clarity”, “ambiguity”, “sequence”, “guiding”, “routing”, “inviting”, “reflection”, “beauty”, “aesthetic” of the spatial, developing a sense of “...” in the architectural space, “liveliness” and “dynamism” of the space, “semanticization” of the architectural space.
- In the architecture of Iran, light is used to induct “a special sense and spirit” to the space”, “sense of spirituality”, elevating the “sense of spirituality”, and developing a “spiritual space”, sense of “movement”, and “continuity of the movement”, “persistence of the movement and routing”, “highlights in the route”, “changing the nature of interior space of the space”, “spatial recognition”, “induction of the sense of place”, induction of a” sense of time”, “identification”, creating a sense of “presence”, “contemplation”, and “permanence” of the people in the space.

Table 2
Research Structure Model

Model of the research structure		Explaining the Role of Light on Quality of the Architectural Spaces in Iranian Mosques	
Research questions	What is the role of light on quality of the architectural spaces of Iranian mosques?	Not has a significant role on “quality” of the architecture of Iranian mosques, and it plays a bold role in elevating the “quality” of architectural space and “the quality and spatial value”.	Research hypotheses
	Which senses and concepts are inducted by the use of light in the architecture of mosques in Iran?	In the Iranian architecture, light is used to induct the concepts like “movement”, “quietness”, “peace”, “silence”, “holiness”, “focus”, “attention”, “passion and excitement”, “clarity”, “ambiguity:, “sequence”, “guiding”, “routing”, “inviting”, “reflection”, “beauty” and “aesthetics” of the architectural space, creating the sense of “memorability” of the architectural space, “passion” and”:dynamism” of the space, “semanticism: of the architectural space.	
		In the Iranian architecture, light is used to induct “a special sense and spirit to the space”, “sense of spirituality”, sense of “movement”, and “persistence” in the movement, “change in the nature of interior architecture”, “spatial recognition”, inducting a sense of place”, inducting a “sense of time”, “sense of belonging”, “identification”, developing a “sense of presence”, “contemplation” and “permanence” of the people in the space.	
	The overall goal of this research is to describe and defy a powerful and arguable theoretical aspects in relation to the role of light in quality of the spaces of mosques in Iranian architecture.		
	A subgoal is set for the research which is the identification of concepts like “movement”, “quietness”, “silence”, “peace”, “holiness”, “focus”, “attention”, “passion and excitement”, “clarity”, “ambiguity”, “sequence”, “guiding”, “routing”, “inviting”, “reflection”, “beauty”, “aesthetics” qualities of the architectural space, and a sense of “memorability” in the architectural space”, “passion” and “dynamism” of the space, “semanticism” of the architectural space, sense of “movement” and “persistent pathway” and continuity in the movement and routing”, “highlights on the route”, “changing the nature of interior space”, “spatial perception”, inducting the “sense of time”, “sense of belonging”, “identification”, developing “a sense of presence”, “deliberation” and “permanence” of the people in the space.		Research goals

3.3 Research objectives

- The overall goal of this research is to describe and defy a powerful and arguable theoretical aspects in relation to the role of light in quality of the spaces of mosques in Iranian architecture.

- A subgoal is set for the research which is the identification of concepts like "movement", "calmness", "calmness", "peace", "spirituality", "focus", "attention", "liveliness and excitement", "clarity", "ambiguity", "sequence", "guiding", "routing", "inviting", "reflection", "beauty", "aesthetics" qualities of the architectural space, and a sense of "memorability" in the architectural space", "liveliness" and "dynamism" of the space, "semanticism" of the architectural space, sense of "movement" and "persistent pathway" and continuity in the movement and routing", "highlights on the route", "changing the nature of interior space", "spatial recognition", inducting the "sense of time", "sense of belonging", "identification", developing "a sense of presence", "deliberation" and "permanence" of the people in the space.

3.4 Research variables

- In the first hypothesis, light is the independent variable and quality of depends on the spatial architecture.
- In the second hypothesis, researching the light is the independent variable and the concepts including, movement, stillness, peace and silent, spirituality, focus, attention, liveliness and excitement, clarity, ambiguity, sequence, guiding, routing, inviting, reflection, beauty and aesthetics of the architectural space, memorability of the architectural space, liveliness and dynamism of the space and significance in the architectural space are the dependent variables.
- In the third hypothesis, the research on light is the independent variable and the concepts like induction "a sense of special sense and spirit to the space", "sense of persistence in the pathway" and the "persistence of routing", "highlights in the pathways", "changing the nature of interior space", "spatial perception", "sense of place", "sense of time", "sense of belonging", "identification", "sense of presence", "contemplation" and "sense of presence" and the people in the space are the dependent variables.

3.5 Research method

Research has a fundamental approach, it pays to analysing the nature/ essence and the relationships between variables in the context of light and the Iranian architecture. It aims to expand the knowledge on recognition of light and design based on the concept of light and perceptions of it in the space. To prove the research hypotheses, and to analyze the type of approach to the light in the architecture, theoretical fundamentals were gathered by field research data collection method with a phenomenological point of view on designing a questionnaire and then analyzing and interpreting the results, the obtained data and the significance in their rates will be presented and discussed in this paper. The tenets and the variables of the research were extracted, the independent and the joint dependent variables in the context of "the role of light in the architecture" was obtained and an effort was to arrange and distribute the questionnaire among the pertinent statistical population.

The SPSS v.18 software was used as the tool of measurement for the results of the research, and the analysis of results were done in the two descriptive, analytic parts. In the descriptive part, a summation is made on the observations by using the frequency tables. The findings were analyzed as the separate questions from the questionnaire and the research variables were minimally analyzed and in the analytical statistics, the examination of assumptions is done by using the factor variance table, table of Pearson coefficient, interfactor frequency table.

This research is done with a descriptive-survey method in which will be done by analysis and comparison between the data with an inductive method to analyse the relationships between the impactful factors.

According to the hypothesis and the literature review, variables and components were defined, content of the questionnaire was categorized based on the obtained variables and each become included in the form of a question or two. Questionnaires are designed as the closed multiple-choice answer questions, with a number of 44 questions according to the variables and the content goals and design concepts the variables are valuated in a five-choice answer questions based on the Likert spectrum (Hafez Nia: 2001: 178) which include the following choices: very much, very, medium, low, very low from top to down respectively.

Pre-tests were administered as the method in filling the questionnaires, and in a limited statistical population (50 persons), the questionnaire were distributed randomly, the validity of the questions were scrutinized and the question which include ambiguity or does not include the insufficient clarity were removed and were offered in different forms after a change in the choice of words. On the other hand, a number of 44 questions were considered which included 41 question which include the main question on the case of the research, 3 of the most important topics for analyzing the errors of the exam was repeated between the questions, which was eliminated in the final exam after analyzing the results and measuring the average and deviation from the standard of each duplicative question due to their close similarities. In the second pre-test, the validity of question were accepted and research of the second pre-text paved the way for the final text. The final test was edited for the target population of expert architects in the country which has an estimated number of 70,000 based on the Cochran formula (Hafez Nia, 2011: 167) 382 questionnaires were designed which were distributed with the random method and was analysed in the SPSS v.18 software after valuation in five bands between 1 and 5 for each of the words and the results are offered in the form of following charts and diagrams.

3.5.1 Cochran Formula

The cochran formula is one of the most used methods for calculating the volume of the sample statistical population. The most allowable error (d) equals 0,50, coefficient of assurance z = 1,96, 95,0 and the values of p and q is each equal 0.5 while the bulk volume is considered N (Hafez Nia, 2013).

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N}\left(\frac{z^2 pq}{d^2} - 1\right)}$$

$$\frac{7000 \times 1.96x^2 \times 0.5 \times 0.5}{7000 \times 0.05x^2 + 1.96x^2 \times 0.5 \times 0.5} = 382.063237$$

- A statistical population with 70000 number of expert individuals in the field of architecture in Iran
- According to the calculated Cochran formula, the sample volume equals: The error level is 50%
- So, 382 people should be questioned for the research.

3.5.2 *Morgan* Table

We use the Morgan table when we don't have any information about the population variance and not about the probability of success or failure. This table generates the maximum number of samples, according to this table, the suggested statistical population is 382 persons.

In this research, the **statistical populatio**n is selected based on the following maxims:

- Offering documents, instances to prove the assumptions
- Having a coordinate point of view with the field of professional research
- Analysing the viewpoint of experts in the field of architecture
- Arriving for overall statistics and results from the viewpoint of professional society of architecture.

3.5.3 Defying the validity and reliability of the text based on the Cronbach formula:

One of the methods for calculating the reliability is to use the Cronbach formula. This approach is used for the internal coordination of the measurement tool including questionnaires or test which measure different scales and use them.

To calculate the Cronbach alpha, the variances for the scores of each sub-category of the questions in the questionnaire (or sub-examinations) and the total variance should be calculated. Then the alpha coefficient should be calculated by this formula, in which:

$$r_a = \frac{j}{j-1}\left(1 - \frac{\sum S_j^2}{S^2}\right)$$

- Number of subcategories of the examination or questionnaire questions
- Variance of the sub-exam
- Variance of the total exam (Sarmad, et al, 2011: 169).

The Cronbach alpha coefficient formula is used for evaluating the degrees of single-dimensionality of the theories, judgements and other topics which are difficult to measure (Sarmad et al, 2012). This examination which result into a coefficient called Cronbach's Alpha is used for the reliability test of the questionnaire which was designed with a likert spectrum method and include multiple-choice answer questions, and by defying the ability to rely on the questionnaire and evaluating each question and showing the weak or strong points and the validity of the questionnaire was resulted with SPSS v.18 software. The reliance coefficient of 41 questions was designed and the alpha coefficient was obtained as d= 0.968. According to the fact that this limitation is the base of the idea of reliance coefficient admissibility is 0.7, the value of 0.968 is a desirable and acceptable score which states the validity of the questionnaire. So the result of the analysis and survey from it would gain a high level of reliability.

Table 3
Reliability Statistics

N of Items	Cronbach's Alpha
41	.968

Likert spectrum was valuated for a research based on the category of five-sets from very low to very high. In this...

Table 4
Valuing the variables with the Likert scale.

Spectrum of evaluating the variables	Very Low	Low	Medium	very	very much
Weight of the spectrum and valuing them	1	2	3	4	5

4. Research analysis, Hypothesis Analysis and Findings

The first step in processing the findings of research instruments, specially for the questionnaires was to pay attention to the proposed types of hypotheses which are regularly derived from the research questions and goals.
In addition, the selected theoretical model and framework generate the main research hypothesis and the most of hypotheses which are going to be subject of examinations have derived from this theoretical framework (HabibPour and Safari, 2010: 391). To prove or refute each of the research assumptions, an inductive statistic method was performed with the test of hypothesis, the t-test. The interpretation and analysis of data was done with the SPSS software.
Premises of the t-test: the fundamental premise of the t-test is based on the fact that the variable data which are dependent on a population with a normal distribution and equal variances are extracted. If the bulk mass is not low for each group, the very small amount and huge ones should not be included in the dada. By performing a kolmogorov-smirnov test to check and adopt the natural distribution of variable dependent data and in the case that the mentioned becomes meaningless, we can be assured of normality in the distribution of data.
If the distribution of dependent variable is so atypical, it is recommended to recover the form of distribution in the groups by a logarithm transformation on the dependent variable or by a square root of the dependent variable in relation to the recovery of the distribution in each group. Identifying and eliminating the unwanted data is also one of the recovery actions for the distribution of data which can pave the way for the applications of t-test. As it is shown on the first output table 1., the number of provables [testable] subjects in each group is shown with N, average of the provables [testable] by Mean, the standard deviation as . Std. Deviation and the average error by Std, Error mean.

4.1 Analysis of the Hypothesis with T-test in SPSS

Hypothesis 1 - Light has a significant role on "quality" of the architecture of Iran, and it plays an effective role on the "quality" of architectural space and elevation of "quality and spatial value". This hypothesis is included in the questions number 1, 11, 12, 30 and 31 in the questionnaire and the answers are marked using the following choices: very much, very, medium, low, very low), each can get the scores of 1 to 5. The following table includes two tests; the first one indicates the variances as equal to 0.05 for the statistics F with the criterion of 0.824sig, in which the assumption regarding the equality of variances can not be refuted; it means that according to the data from this sample, variances for quality of in the space and light are equal. The second test is the comparison between averages which has a decisive criterion of tailed sig-2 equal to 0.70 with the assumption of equality in the variances, that is much greater than the value of 0.05 and there is not enough argument to refute it.

Table 5
Group Statistics

VFI		N	Mean	Std. Deviation	Std. Error Mean
Q1	E	3	4.33	.577	.333
	D	26	4.15	.784	.154
Q11	E	3	2.67	1.528	.882
	D	26	3.54	.647	.127
Q12	E	3	3.00	1.000	.577
	D	26	4.15	.784	.154
Q30	E	3	4.00	1.000	.577
	D	26	3.85	.967	.190
Q31	E	3	4.00	.000	.000
	D	26	3.62	.941	.185

Hypothesis 2. In the Iranian architecture, light is used to induct concepts like "movement", "calmness", "peace", "calmness", "spirituality", "focus", "attention", "liveliness and excitement", "clarity", "ambiguity", "sequence" ,"guiding", "routing", "inviting", "reflection", "beauty", "aesthetic" of the architectural space, creation of a sense of "memorability" i the architectural space, "vitality" and "dynamism" of the space", "semanticization" of the architectural space. This hypothesis was offered by the question with the following number on the questionnaires (3, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 36, 37, 38, 39, 40, 41 and the answers are marked using the following choices: Too much, very, medium, low, very low), each can get the scores of 1 to 5.

The following table includes two exams, both are administered along with the concept of hypothesis 2; the first exam shows the amount of variance equality as 0.05 for the statistics (F), and it shows that with a criterion of 0.03 sig, the assumption of equality in variances cannot be refuted. It means that according to this sample data, the variance on the conditions of calmness, peace, beauty and different variables of the second hypothesis are equal to each other.
The second exam is the comparison of averages in which by assuming an equality in the variances on the movement variable related to the question 27, the criterion for routing as tailed Sig-2 was equal to 0.52 that is obviously much greater than 0.05, thus, there would not be enough reasons to refute it.

Table 6
Independent Samples Test

		Levene's Test for Equality of Variances		T-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Q1	**Equal variances assumed**	.050	.824	.382	27	.706	.179	.470	-.785	1.144
	Equal variances not assumed			.489	2.932	.659	.179	.367	-1.004	1.363
Q11	**Equal variances assumed**	7.642	.010	-1.910	27	.067	-.872	.456	-1.808	.065
	Equal variances not assumed			-.978	2.084	.427	-.872	.891	-4.562	2.818
Q12	**Equal variances assumed**	.004	.953	-2.358	27	.026	-1.154	.489	-2.158	-.150
	Equal variances not assumed			-1.931	2.293	.177	-1.154	.597	-3.434	1.126
Q30	**Equal variances assumed**	.192	.665	.260	27	.797	.154	.591	-1.059	1.367
	Equal variances not assumed			.253	2.453	.820	.154	.608	-2.049	2.356
Q31	**Equal variances assumed**	7.041	.013	.696	27	.492	.385	.552	-.749	1.518
	Equal variances not assumed			2.083	25.000	.048	.385	.185	.004	.765

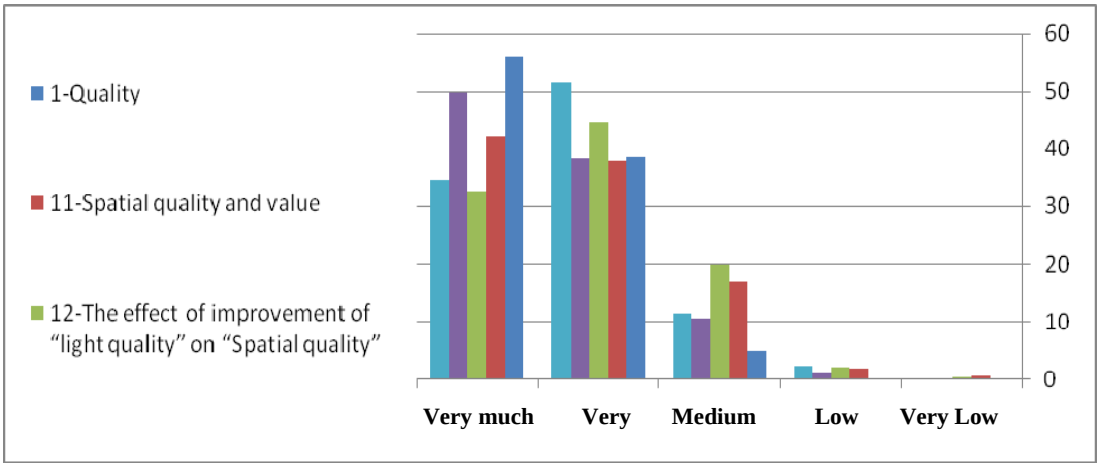

Fig. 5. Histogram

Table 7
Group Statistics

	VF2	N	Mean	Std. Deviation	Std. Error Mean
Q3	E	3	5.00	.000	.000
	D	20	4.00	.649	.145
Q10	E	3	5.00	.000	.000
	D	20	3.55	1.099	.246
Q13	E	3	4.00	.000	.000
	D	20	3.55	1.191	.266
Q15	E	3	3.00	.000	.000
	D	20	3.20	1.473	.329
Q16	E	3	3.00	.000	.000
	D	20	4.05	.945	.211
Q17	E	3	4.00	.000	.000
	D	20	4.30	.923	.206
Q18	E	3	5.00	.000	.000
	D	20	3.90	.968	.216
Q19	E	3	3.00	.000	.000
	D	20	3.65	1.182	.264
Q20	E	3	3.00	.000	.000
	D	20	3.75	.967	.216
Q21	E	3	4.00	.000	.000
	D	20	3.65	1.089	.244
Q22	E	3	4.00	.000	.000
	D	20	4.45	.510	.114
Q23	E	3	3.00	.000	.000
	D	20	3.55	1.099	.246
Q24	E	3	2.00	.000	.000
	D	20	3.70	.733	.164
Q25	E	3	3.00	.000	.000
	D	20	3.15	.745	.167
Q26	E	3	3.00	.000	.000
	D	20	3.15	1.182	.264
Q27	E	3	3.00	.000	.000
	D	20	3.80	.768	.172
Q28	E	3	5.00	.000	.000
	D	20	3.70	1.081	.242
Q29	E	3	5.00	.000	.000
	D	20	3.00	1.076	.241
Q36	E	3	4.00	.000	.000
	D	20	4.40	.821	.184
Q37	E	3	4.00	.000	.000
	D	20	3.75	.786	.176
Q38	E	3	3.00	.000	.000
	D	20	3.75	.786	.176
Q39	E	3	3.00	.000	.000
	D	20	3.30	1.525	.341
Q40	E	3	2.00	.000	.000
	D	20	3.30	1.380	.309
Q41	E	3	1.00	.000[a]	.000
	D	20	2.00	.000[a]	.000

Table 8
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Q3	Equal variances assumed	1.826	.191	2.617	21	.016	1.000	.382	.205	1.795
	Equal variances not assumed			6.892	19.000	.000	1.000	.145	.696	1.304
Q10	Equal variances assumed	10.090	.005	2.240	21	.036	1.450	.647	.104	2.796
	Equal variances not assumed			5.900	19.000	.000	1.450	.246	.936	1.964
Q13	Equal variances assumed	11.142	.03	.642	21	.528	.450	.701	-1.009	1.909
	Equal variances not assumed			1.690	19.000	.107	.450	.266	-.107	1.007
Q15	Equal variances assumed	7.132	.014	-.231	21	.820	-.200	.867	-2.003	1.603
	Equal variances not assumed			-.607	19.000	.551	-.200	.329	-.889	.489
Q16	Equal variances assumed	17.191	.000	-1.888	21	.073	-1.050	.556	-2.207	.107
	Equal variances not assumed			-4.972	19.000	.000	-1.050	.211	-1.492	-.608
Q17	Equal variances assumed	4.194	.053	-.552	21	.587	-.300	.544	-1.431	.831
	Equal variances not assumed			-1.453	19.000	.163	-.300	.206	-.732	.132
Q18	Equal variances assumed	27.734	.000	1.930	21	.067	1.100	.570	-.085	2.285
	Equal variances not assumed			5.082	19.000	.000	1.100	.216	.647	1.553
Q19	Equal variances assumed	13.422	.001	-.934	21	.361	-.650	.696	-2.098	.798
	Equal variances not assumed			-2.459	19.000	.024	-.650	.264	-1.203	-.097
Q20	Equal variances assumed	7.083	.015	-1.318	21	.202	-.750	.569	-1.934	.434
	Equal variances not assumed			-3.470	19.000	.003	-.750	.216	-1.202	-.298
Q21	Equal variances assumed	8.248	.009	.546	21	.591	.350	.642	-.984	1.684
	Equal variances not assumed			1.437	19.000	.167	.350	.244	-.160	.860
Q22	Equal variances assumed	271.174	.000	-1.497	21	.149	-.450	.301	-1.075	.175
	Equal variances not assumed			-3.943	19.000	.001	-.450	.114	-.689	-.211
Q23	Equal variances assumed	8.383	.009	-.850	21	.405	-.550	.647	-1.896	.796

	Equal variances not assumed			-2.238	19.000	.037	-.550	.246	-1.064	-.036
Q24	Equal variances assumed	9.612	.005	-3.940	21	.001	-1.700	.431	-2.597	-.803
	Equal variances not assumed			-10.376	19.000	.000	-1.700	.164	-2.043	-1.357
Q25	Equal variances assumed	5.590	.028	-.342	21	.736	-.150	.439	-1.063	.763
	Equal variances not assumed			-.900	19.000	.379	-.150	.167	-.499	.199
Q26	Equal variances assumed	5.283	.032	-.215	21	.831	-.150	.696	-1.598	1.298
	Equal variances not assumed			-.567	19.000	.577	-.150	.264	-.703	.403
Q27	Equal variances assumed	7.460	.013	-1.769	21	.091	-.800	.452	-1.740	.140
	Equal variances not assumed			-4.660	19.000	.000	-.800	.172	-1.159	-.441
Q28	Equal variances assumed	9.666	.005	2.042	21	.054	1.300	.637	-.024	2.624
	Equal variances not assumed			5.378	19.000	.000	1.300	.242	.794	1.806
Q29	Equal variances assumed	7.651	.012	3.156	21	.005	2.000	.634	.682	3.318
	Equal variances not assumed			8.312	19.000	.000	2.000	.241	1.496	2.504
Q36	Equal variances assumed	11.677	.003	-.828	21	.417	-.400	.483	-1.405	.605
	Equal variances not assumed			-2.179	19.000	.042	-.400	.184	-.784	-.016
Q37	Equal variances assumed	9.464	.006	.540	21	.595	.250	.463	-.713	1.213
	Equal variances not assumed			1.422	19.000	.171	.250	.176	-.118	.618
Q38	Equal variances assumed	9.464	.006	-1.619	21	.120	-.750	.463	-1.713	.213
	Equal variances not assumed			-4.265	19.000	.000	-.750	.176	-1.118	-.382
Q39	Equal variances assumed	7.399	.013	-.334	21	.742	-.300	.898	-2.168	1.568
	Equal variances not assumed			-.880	19.000	.390	-.300	.341	-1.014	.414
Q40	Equal variances assumed	6.561	.018	-1.599	21	.125	-1.300	.813	-2.991	.391
	Equal variances not assumed			-4.212	19.000	.000	-1.300	.309	-1.946	-.654

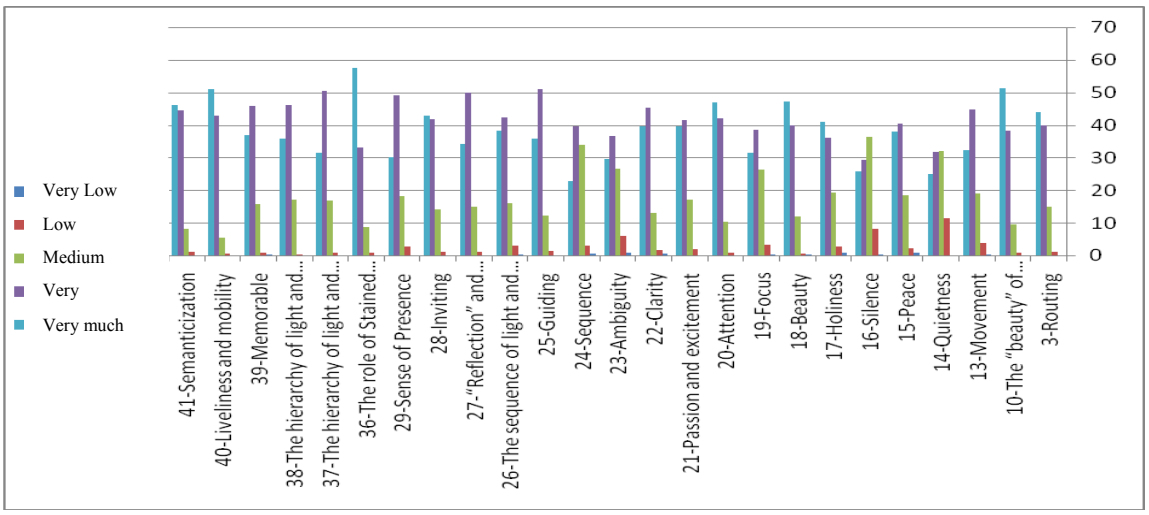

Fig. 6. Histogram

Hypothesis 3 To induct "a special sense and spirit" to the space", "sense of spirituality", elevating the "sense of spirituality", and developing a "spiritual space", sense of "movement", and "continuity of the movement", "persistence of the movement and routing", "highlights in the route", "changing the nature of interior space of the space", "spatial recognition", induct a "sense of place", induct the "sense of time", "sense of belonging", "identification", developing a sense of "presence", "contemplation" and "permanence" of the people in the space.

This hypothesis is put forward by the following questions in the questionnaires: no. 2, 4, 5, 6, 7, 8, 9, 32, 33, 34, 35 and the answers are marked using the following choices: Too much, very, medium, low, very low), each can get the scores of 1 to 5.

he following chart includes two tests, which are done along with the ideas of hypothesis 3; the first test is the equality of variances with the amount of 0.05 for the statistics (F) which is shown with the criterion of sig 0.42, it shows that the hypothesis of equality in the variances can not be refuted. It means that according to the data of the following sample, variance is equal between the sense of time, sense of place induction of spatial recognition or other variables of the third hypothesis. The second test is a comparison between the averages which is equal to 0.131 by considering the equality of variances in the variable of sense of place related to the question 8 and with a scale name of tailed Sig-2 which is much greater that 0.05, so there would be not enough reason to refute.

Table 9
Group Statistics

	VF3	N	Mean	Std.	Std. Error
q2	E	5	2.60	1.342	.600
	D	17	4.35	.862	.209
q7	E	5	3.20	.447	.200
	D	17	3.71	.470	.114
q8	E	5	3.00	.000	.000
	D	17	3.71	.985	.239
q9	E	5	4.00	.000	.000
	D	17	3.47	.943	.229
q10	E	5	4.00	.000	.000
	D	17	3.59	.507	.123
q11	E	5	3.20	.447	.200
	D	17	3.35	.493	.119
q13	E	5	4.00	.000	.000
	D	17	4.35	.493	.119
q48	E	5	2.40	.894	.400
	D	17	3.71	.470	.114
q49	E	5	2.60	1.342	.600
	D	17	3.94	.659	.160
q50	E	5	2.60	1.342	.600
	D	17	3.71	1.105	.268
q51	E	5	4.20	.447	.200
	D	17	4.06	.556	.135

Table 10
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
q2	Equal variances assumed	.660	.426	-	20	.002	-1.753	.497	-2.790	-.716
	Equal variances not assumed			-	5.011	.040	-1.753	.635	-3.385	-.121
q7	Equal variances assumed	.790	.385	-	20	.045	-.506	.237	-1.000	-.012
	Equal variances not assumed			-	6.836	.065	-.506	.230	-1.053	.041
q8	Equal variances assumed	12.289	.002	-	20	.131	-.706	.448	-1.641	.229
	Equal variances not assumed			-	16.000	.009	-.706	.239	-1.212	-.199
q9	Equal variances assumed	14.113	.001	1.233	20	.232	.529	.429	-.366	1.425
	Equal variances not assumed			2.314	16.000	.034	.529	.229	.044	1.014
q10	Equal variances assumed	141.414	.000	1.784	20	.090	.412	.231	-.070	.893
	Equal variances not assumed			3.347	16.000	.004	.412	.123	.151	.673
q11	Equal variances assumed	2.316	.144	-.621	20	.541	-.153	.246	-.666	.361
	Equal variances not assumed			-.656	7.137	.532	-.153	.233	-.702	.396
q13	Equal variances assumed	48.000	.000	-	20	.131	-.353	.224	-.821	.115
	Equal variances not assumed			-	16.000	.009	-.353	.119	-.606	-.100
q48	Equal variances assumed	2.230	.151	-	20	.000	-1.306	.295	-1.921	-.690
	Equal variances not assumed			-	4.667	.028	-1.306	.416	-2.398	-.213
q49	Equal variances assumed	3.333	.083	-	20	.005	-1.341	.428	-2.234	-.449
	Equal variances not assumed			-	4.581	.088	-1.341	.621	-2.982	.300
q50	Equal variances assumed	.007	.934	-	20	.075	-1.106	.588	-2.333	.121
	Equal variances not assumed			-	5.698	.146	-1.106	.657	-2.735	.523
q51	Equal variances assumed	.003	.954	.518	20	.610	.141	.273	-.427	.710
	Equal variances not assumed			.585	8.043	.574	.141	.241	-.414	.697

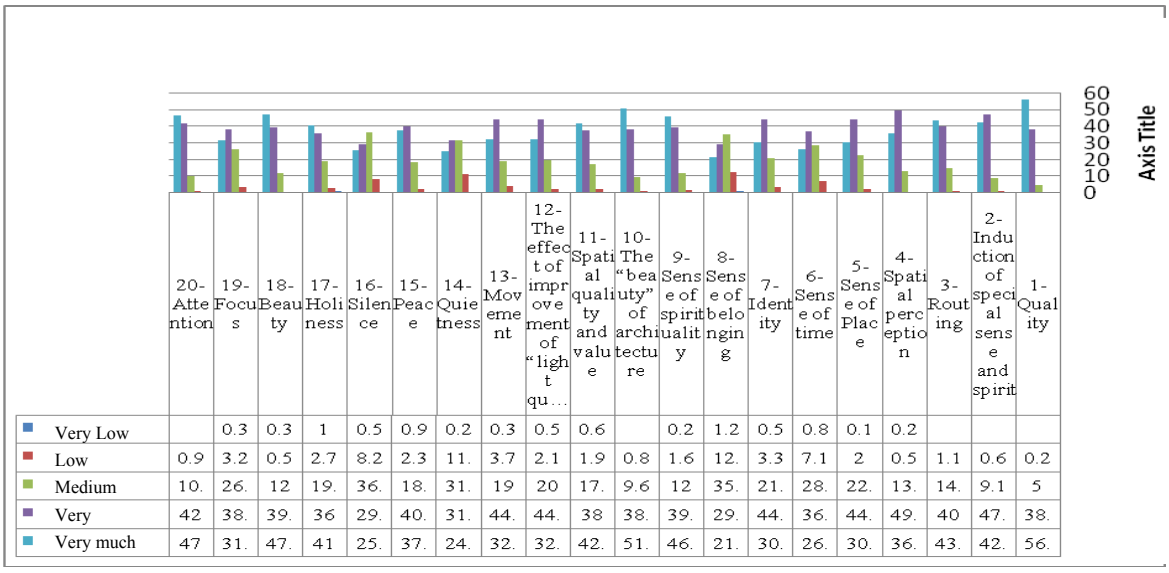

Fig. 7. Histogram

Table 11
Frequency

	Very low	Low	Medium	Very	Very much
N	**.001**	**.002**	**.003**	**.004**	**.005**
1-Quality		0.2	5.0	38.6	56.2
2-Induction of special sense and spirit		0.6	9.1	47.6	42.7
3-Routing		1.1	14.9	40.0	43.9
4-Spatial perception	0.2	0.5	13.4	49.7	36.1
5-Sense of Place	0.1	2.0	22.6	44.4	30.8
6-Sense of time	0.8	7.1	28.8	36.9	26.4
7-Identity	0.5	3.3	21.3	44.4	30.4
8-Sense of belonging	1.2	12.3	35.4	29.3	21.8
9-Sense of spirituality	0.2	1.6	12.0	39.8	46.4
10-The “beauty” of architecture		0.8	9.6	38.3	51.2
11-Spatial quality and value	0.6	1.9	17.2	38.0	42.3
12-The effect of improvement of “light quality” on	0.5	2.1	20.0	44.6	32.6
13-Movement	0.3	3.7	19.0	44.7	32.3
14-Quietness	0.2	11.3	31.9	31.7	24.9
15-Peace	0.9	2.3	18.5	40.4	37.9
16-Silence	0.5	8.2	36.4	29.3	25.7
17-Holiness	1.0	2.7	19.3	36.0	41.0
18-Beauty	0.3	0.5	12.0	39.8	47.3
19-Focus	0.3	3.2	26.4	38.6	31.5
20-Attention		0.9	10.2	42.0	47.0
21-Passion and excitement	0.2	1.9	17.0	41.4	39.5
22-Clarity	0.7	1.5	13.0	45.2	39.5
23-Ambiguity	1.0	6.0	26.7	36.6	29.6
24-Sequence	0.6	3.1	33.8	39.7	22.8
25-Guidance		1.3	12.2	50.9	35.7
26-The sequence of light and dark	0.4	2.9	16.0	42.4	38.3
27-“Reflection” and “Reflection in architecture”		1.0	14.8	49.9	34.3
28-Inviting	0.2	1.1	14.1	41.7	42.9
29-Sense of Presence		2.6	18.1	49.0	30.2
30-The role of color on the quality of the Persian		1.3	10.6	38.4	49.8
31-The role of light to create "spatial various		2.3	11.5	51.5	34.7
32-“Contemplation” and “persistence”	0.2	1.1	15.8	48.7	34.2
33-To create “the spiritual space” and	0.2	1.1	11.0	30.0	57.5
34-To create the sense of “movement” and	0.2	1.8	11.7	41.1	45.2
35-Showing time		2.7	18.6	36.6	42.1
36-The role of Stained glasses and colored lights	0.2	0.8	8.6	33.0	57.4
37-The hierarchy of light and “guiding”	0.2	0.7	16.9	50.6	31.6
38-The hierarchy of light and “routing”	0.2	0.3	17.2	46.0	35.9
39-Memorable	0.5	0.9	15.8	45.8	36.9
40-Liveliness and mobility	0.1	0.6	5.4	42.8	51.1

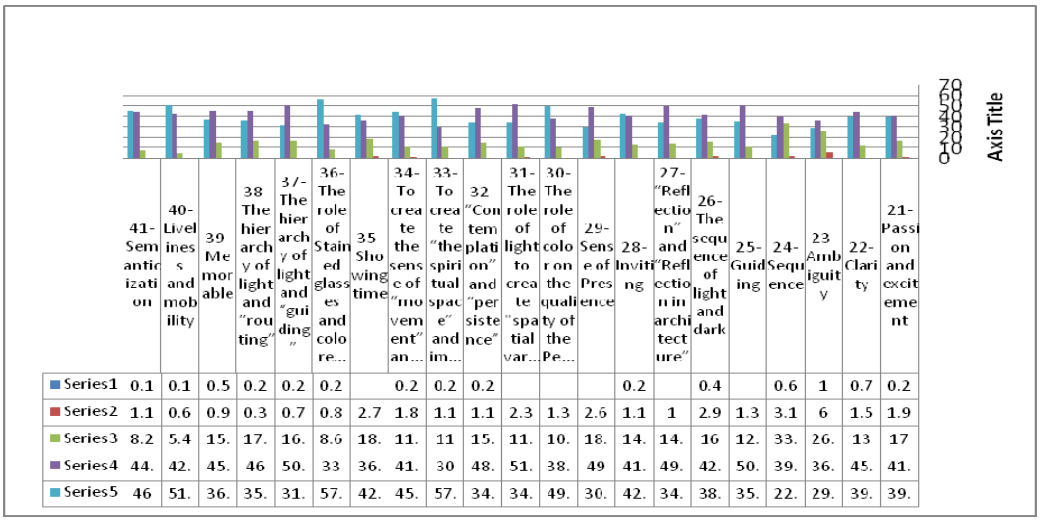

Fig. 8. Histogram

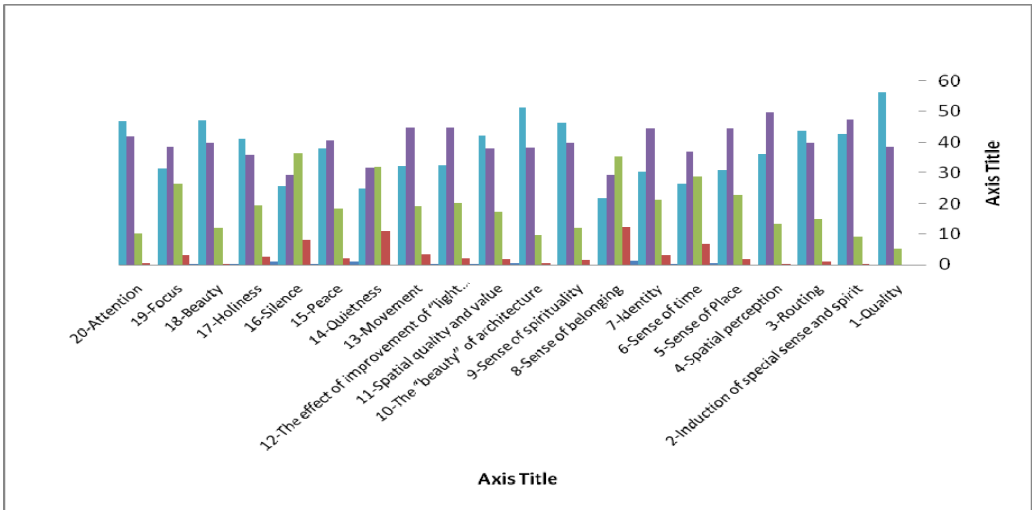

Fig. 9. Histogram

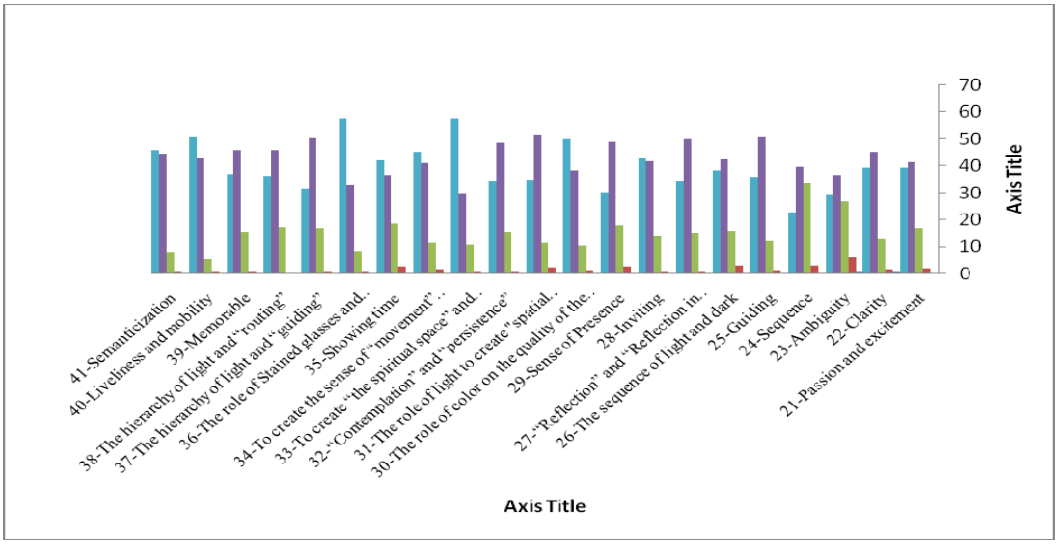

Fig. 10. Histogram

5. The Research Results

The position and the function of the light in the Iranian mosques and its role on quality of the architectural spaces are studied in this research, and as the instances of the case, a number of three valuable mosques of Iran, *Sheikh Lotf-Allah* mosque, *Vakil* Mosque and *Nasir-Al-Molk* mosque was selected. Different approaches are used in the Iranian architecture in order to have an optimal use of light, receiving light and regulating it, distribution of light and light refractions and to harness the light. Reflection of light have created enchanting visual aspects. Creation of highlights is one of the widely used techniques in the architecture. Light can describe the spatial boundaries. Purifying light and shadow, the fun arena of light and color is the gradual course from light to the dark, sudden shadows and lights; association of the beauties is some of the light processing techniques in the Iranian architecture. The instances of guiding by the light is widely seen in the architecture of Iran, light has a guiding and conduction role in the darkness. Development of a spiritual sense in the religious spaces are some of the valuable instances which are pictured by the optimal use of the light. Development of a virtual texture and frame of the image with the help of darkness and light is one of the functions of light aesthetics and the manifestation of light and color and the affinity between these two will lead to the beauty of the space. Use of the colorful glasses add to the beauty and semantic functions of Iranian architecture, and shows different reflections of the light. One of the tricks to defy the suspension and movement in the spaces is to use of lights. The impactful methods of lighting in Iranian architecture is the manifestation of values, meanings and concepts. Light inducts values, meanings and concepts like peace, quietness, and spiritual sense and spirit, and the sense of routing and guidance.In the Iranian architecture light was treated with a semantic and functional approach, and this point was highly considered that the light can develop a beautiful and meaningful space in addition to the functional arguments.

The research methodology is a descriptive-survey method, and to survey the research hypothesis, questionnaires were employed, SPSS v.18 software is used for the purpose of data analysis, finally the research results shows that light has a significant role on describing and interpreting the space. Light has a significant role in "quality" of the architectural spaces of Iranian mosques, and also on elevating the "quality" of the architectural space, and also in n the elevation of "Spatial quality and value" and to induct the concepts like "movement", "stillness","peace" and "silence", "spirituality", "focus", "attention", "liveliness and excitement", "clarity", "ambiguity", "sequence", "guiding", routing", inviting", "reflecting", "beauty" and "aesthetics" of the architectural space, inducting "a special sense and spirit to the space", inducting a sense of "memorability" of the architectural space, "liveliness" and "dynamism" of the space, "semanticism" of the architectural space, sense of "movement" and "persistent pathway" and continuity in the movement and routing", "highlights on the pathway", "changing the nature of interior space", "spatial recognition", inducting the "sense of time", "sense of belonging", "identification", developing "a sense of presence", "deliberation" and "permanence" of the people in the space, it also has a great role on identification of the architectural space.

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