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EVALUATING THE EFFECTIVE FACTORS IN PROMOTING THE TARGET AUDIENCE-BASED ATTRACTION OF A MUSEUM WITH THE APPROACH OF INCREASING SOCIAL INTERACTIONS (CASE STUDY: STUDY OF TEHRAN CITY REGION 2, IRAN)

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ABSTRACT

As a place for social relations, museums can be effective in sociability, increasing social interactions, and creating vitality. The society can create a dynamic, lively and active atmosphere in the museum as a public place. In this essay, the parameters affecting the architectural design of museums to increase audience attention were studied by investigating the factors influencing social interactions in museums and the impact of some human-physical parameters. The research methodology consisted of hypothesis testing and a case study of public places of museums, which was investigated through a survey and a questionnaire. Correlation analysis was applied to the collected data via SPSS statistical software and meaningful relationships between variables affecting sociability were concluded. The results revealed that the sociability of the architecture of public places is achieved by the association of their physical, spatial elements and the social-psychological factors of their audience.

INTRODUCTION

According to the ICOM - International Council of Museums, museums have undergone many changes and have expanded to a large extent. Today, the main target of museums is the audience, in a way that museums are meaningless without audience. The museum belongs to its audience and tries to define social and human goals. To achieve such goals, the museum tries to know its audience and their characteristics [1, 2]. Interacting with the internal

and external world, the museum should open its world toward its society and bring dynamism [3]; [4]. Museums should have the necessary social interactions with society. Today, the design of museums is one of the most important aspects of architecture and is considered as a sign of the understanding and awareness of a museum's responsibility to society. This has become one of the most fundamental concerns of organizations worldwide in recent years. Today, there has been a significant change in the function of museums, and they are now becoming an interactive center rather than a place to keep artifacts. In the past, museums used to be exclusively responsible for collecting and preserving cultural properties, but now they try to be in line with social relations, current realities and future needs [5]. It seems that places in which audience awareness about each other's presence and intimacy raises, cause more social interactions between the museum and society. This is one of the most important approaches to strengthen civil society in the presence of visual and audio media. It is hoped that by developing these interactions and understandings, a sustainable society will be achieved. Hence, in this study, we have tried to investigate the relationship between social interactions in modern museums and its effects on society by considering their relationship with people. [4]. According to Madsen et al (2020) a simple thematic, user-mindset, agency and narrative closure are key criteria for an exhibition to boost the potential for exploration by creating numerous perspectives and depth on a specific area of interest to maintain the users' curiosity and central attention. Socialization in public spaces belonging to the museum places more emphasis on the relationships between its users, the audience and their social interactions. To this end, the case study of this research has focused on the public space of museums. The question is whether the physical design of the architecture can establish positive and constructive social relationships among the audience and increase the opportunities for interpersonal interactions. Social interaction is a necessity to meet human needs and can contribute to personal development. Considering social demands, paving the way for better relations is another effect of higher socialization of the museum as a public space, which was studied in this research.

Therefore, in this paper, the role of pivotal visitors in the museum is investigated, and followed by that, the factors which affect the design of the museum's architecture with the approach of social interactions are identified. Effective parameters in museum design are collected by a questionnaire, and in the last part of the research, the data are analyzed by SPSS software in order of priority in the design of the museum. So, the most important identified factors are ranking and prioritizing the design respectively. Finally, Revit software as a 3D modeling is used to demonstrate effects of substantial factors on modeling a modern museum. The present ~~one of the~~ research aims to study the effects of the different factors by 3D modeling of museums for architectural assets in order to support the museum heritage system, for conservation and enhancement of the architectural assets object of study [6]

The Key Role of The Audience in The Museum

Despite the fact that substantial public museums' survival is by no means guaranteed, an active dialogue with potential and existing audience and special

interest groups is also necessary [1]. Museums' role involves conserves, acquires, communications, researches, and exhibits for different goals including research, enjoyment, educational and evidence for the world environment during historical periods [7]. People are the only reason why museums still exist and if it is ignored, ~~the~~ museums will be endangered in the future. Factors such as the engagement of members of the society and the museum, recognizing the demands of audiences and appreciating people's expectations are fundamental principles that provide the success of a museum. Recognizing the audience is one of the main responsibilities of the museum that can be a proper solution for museum designers to attract target audiences [2]. Museums began to be aware of the significance of understanding who their visitors are and why these visitors visits the museum [8]. Museums should change their visitors' approach through transforming them from visitors to active participants ensuring that their visit is enjoyable providing opportunities for social interactions, encouraging ~~the~~ visitors to revisit the museum [9, 10]. With the development and growth of museums in addition to paying attention to objects, museums have adopted new themes to convey their message. At this stage, they have attained a social status. However, the audience-based museums faced challenges from critics and museums that desired to express one message or direct social contents were questioned. It was argued whether limiting the definition and function of a museum to express one or more specific messages or defining its effects for a specific limited time might result in the loss of the attraction of museums. On the other hand, ignoring the audience interest in museums resulted in lack of audience attraction. Hence, museums started to show their interest to attract audience by considering multiple aspects of what should be presented to the audience. When museums became audience-based, they began to think about the freedom of the audience and believe that a part of the museum is related to the audience's mind and is not in the control of the museum owners. Therefore, the expression tools at this stage paid special attention to the audience and its role as a medium and means of expression. So, the museum is meaningless without the audience, and it has to recognize its audiences and their characteristics to achieve its goals and make plans. The museum effects are not limited to a specific and consistent message or interpretation, and each audience may develop a different interpretation over time. The combination of these attitudes led the museums to become audience-based, and all their elements are in good agreement with the characteristics of their audience. Moreover, the architecture of museums is an opportunity for the audience and their presence [11]. Social interaction depends on a social space which is able to meet human needs. The factors affecting social interactions cover a wide range of perceptual, conceptual, functional, and objective components [12].

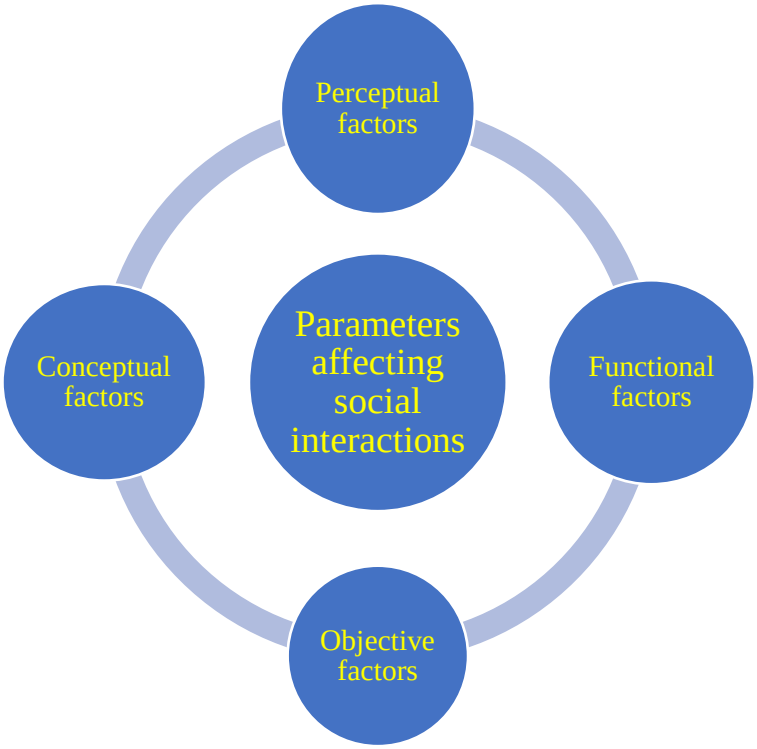


Figure 1 : *Factors Affecting Social Interactions (Source: Author)*

Investigating Sociability of Museums Public Place

Parameters affecting the sociability of a place are divided into several general categories including psychosocial and physical-spatial factors which have been investigated.

The Effect of Socio-Psychological Characteristics of Visitors on The Sociability of The Place

In this section, it is assumed that the socio-psychological characteristics of the audience have a direct impact on the sociability of the public place of architecture and are considered as a creator. Meaningful correlations were obtained between some socio-psychological characteristics of visitors and the sociability of the museum. These correlations revealed a direct of these parameters on sociability. There are correlations between the gender, age, education, major and the occupation of visitors as well as their tendency to interact in the museum.

The Effect of The Public Spaces' Physical Features of The Museum Architecture and Its Sociability

It is assumed that physical-spatial factors affect the area's sociability. This affects direct and indirect functionality. The direct functionality is a perceptual and semantic factor that changes and increases the relationship between the

audiences. This happens by creating mental images following the audiences' previous belongings and experiences. Direct and physical ability enables interactive behaviors in the area. [10, 13].

Table 1 : *The Relationship Between the Factors Affecting Social Interactions with The Physical Characteristics of The Museum Space (Source: Author)*

Physical-spatial components of the museum	
Proper lighting	Entering path inducing a sense of invitation
Size	Polygonal geometry of the area
high altitude	Broken form
Materials	Providing connection with all parts of the building
The special geometry of the ceiling	Locating in the vicinity of public socio-cultural places
ceiling skylight	Creating contrast by light and shade
Void existence	Landscape designing

According to the viewpoints of the museum's visitors, affecting physical-spatial factors are prioritized based on importance in the table below. Among the first 8 influential physical-spatial features that have a significant effect on the sociability of architectural space, from the area interactors' point of view, only a few features of the area's fixed elements are seen. The appropriate location of the area in the spatial organization of the whole building and the semi-fixed elements of the area has the greatest effect. The results of this table are obtained by direct analysis of the question based on correlation analysis, proving significant relationships between variables by comparing the questions related to the questionnaire in statistical software.

Table 2 : Adaptive Comparison of Factors Influencing Social Interactions and Determining the Appropriate Parameters in Architectural Design of The Museum (Reference: Author)

	Physical-spatial components of the museum	Factors affecting social interactions
1	Tall entrance and a sense of invitation	Perceptual
2	Transmission of natural light through parametric and polygonal roofs into the museum environment	Practical
3	Improving the quality of the environment by taking advantage of the effects of light in the museum	objective
4	Creating a landscape for the audience in the museum's outdoor environment	Practical
5	The play of light and shadow (contrast) in the museum environment	Objective
6	Using parametric design on museum ceilings	Practical
7	Using materials such as glass, exposed	Objective

	concrete, and metal as the broken shapes in the interior architecture facade	
8	Functional-based and artistic use of natural light transmitting through glass ceilings during the day	Practical
9	Using skylights with polygonal shapes in the museum's floors	Objective
10	Designing polygon forms and sharpness inside the museum	Objective
11	Using a wide luxury lobby	Practical
12	Building cultural and social places such as museums near public places such as parks	Conceptual
13	Designing broken and pyramidal shapes	Objective
14	Designing separate and separable areas as a gallery	Practical
15	The existence of a museum as a cultural and social entity in society	Conceptual

There is a significant correlation between the number of interactions of a place's audience with its physical characteristics. The number of interactions in a place, which is a sign of sociability, is measured by parameters such as times of visiting the place, frequency of use and duration of stopping. In other words, the more interpersonal and transpersonal interactions are formed in a place, the more sociable it is. The alignment of the human physical factor under the influence of the continuous use of the place by the users and audience as well as the stability of interpersonal interaction patterns lead to the increase of visiting times of users and reinforces their mental image. Specific physical characteristics will be influential in the combination of the psychological characteristics of users as well as the capability of the place.

DETERMINING THE PARAMETERS AFFECTING THE MUSEUM'S ARCHITECTURAL DESIGN OF THE MUSEUM WITH THE APPROACH OF SOCIAL INTERACTIONS

Creating Cultural and Social Spaces as A Museum Next to Public Spaces Such as Parks

Along with urban growth and development and the increase of various environmental and visual pollution, urban spaces have lost their active role. Therefore, the need to pay attention to urban parks is a necessity of urban life. Affecting various environmental, economic and social aspects that are the foundations of urban sustainability, urban parks improve the quality of life and livability of cities and, with their aesthetic functions, are effective in achieving a more favorable environmental situation of cities [14]

In addition to affecting the quality of the urban environment, urban parks have created services and some space to increase social interactions, and because they make the city readable, in addition to its local identity, they become part of the national identity and play an important role in the urban sustainable development [15].

Entrance designing

Each entrance can be defined from two objective and subjective perspectives. Therefore, it is expected that the entrance of an urban space is able to receive and invite people. This ability is ensured when a person comes to it with enthusiasm and a sense of going from one world to another. Different parameters such as temperatures, pressure differences across the air curtain and different door usage frequencies have a substantial effect on visitors [16]. As a matter of fact, creating and improving the sense of invitation at the entrance of the urban space causes the continuity and stability of people's presence in the place, creates a correct relationship and establishes the expected interactions with the urban space. Consequently, in addition to being attractive to the entering audience, the design of a tall entrance for the museum can also be a criterion for recognizing the identity of the building.

Using A Wide Luxury Lobby

The public spaces of the building are to some extent a sign of the location and lifestyle of its inhabitants. The interior design of the space and decoration of public and common areas such as building lobbies are important. The lobby is also the first and last impression of the inwards of a museum and such an important space for branding [17] .The main parts of the lobby include the sentry and the sitting room, each of which needs its own design. Museum buildings are traditionally designed to be outstanding, both architecturally spectacular and as places that are different from the ordinary. The first description of museum lobbies describes them as physical connections [18], that is as a space that links the entrance to the various exhibition galleries. The function of separation becomes clear when issues of placing the ticketing in or after the main lobby are discussed [19].

Using Parametric Ceilings in The Museum

Parametric architecture provides a wide range of illustrations and complex, specific ideas for architects. By introducing the final product and providing a digital sample of the product, digital architecture offers the possibility of examining the types of parameters that the product faces. In this way, it is possible to avoid wasting a lot of unnecessary items and materials and many of the items that are responsible are applicable in the long run, instead. Therefore, the use of parametric and pyramidal ceilings makes a form attractive, either indoors or outdoors. In fact, in addition to providing geometric models, the parametric design has the ability to display the relationships between them in the form of a chain structure of hierarchical relationships and based on how to organize the hierarchy of parameters, some models and / or elements are completely independent and fixed parameters (such as inputs and primary data) and some others are dependent parameters which are changed influenced by data received from independent parameters. Such a structure is fixed in nature, although the final model may be changed with control and supervision or by applying changes to the independent parameters, a different combination may be created. Parametric software is not only capable of producing new forms, but also can provide suitable solutions

for various building and architectural issues, including their effective performance in reducing the consumption of building materials, proper organization of building shells in order to reduce energy consumption, applying optimal settings in layouts and etc. [20].

Functional-Centered Used of Natural Light

One of the most important areas of glass ceilings is the passage of light rays. To have a successful lighting design, lighting designers have particular considerations that affect lighting on space, objects, and purpose. Color rendered, color temperature, texture, form, viewing angles, layered light and maintenance are all factors that contribute to the whole[13]. In fact, by using these types of ceilings, we will be able to receive natural ambient light in a confined space and among the advantages of glass ceilings, the capability to transmit light and receive light and enjoyment of sunlight is worth mentioning.

Passing Natural Light Through the Ceiling into The Museum Environment

Lighting plays a significant role in developing interactions between humans and museum artifacts in one defined space[13]. Natural Light can be used to have great effects to dramatize and enliven the design of any building [21] .Using natural light transmission into space through parametric ceilings can affect the nature of the interior part, by which creating areas of light and darkness, creating an integrated space without the use of separating elements and materials, dividing that space into separate parts and giving meaning to the interior space are allowed.

Using Skylights with Polygonal Shapes on The Museum

As we know, the skylights are mostly an empty space in the middle of the building which makes it possible to see the upper and lower classes. Such spaces can induce three senses to the audience: a sense of space, a readability of space, and a sense of function.

Light And Shadow Play (Contrast) In The Museum Space

Museum lighting should be in the direction of emphasizing reality and colors should not be changed using stained glass, reflective surfaces, etc. The displays and artifacts were much larger in scale compared to the other areas of the museum. Safety is a significant factor in the lighting of the space. The lighting did not have glare or dramatic shadows [13, 22]. The lighting of museum, in proportion to the readiness of the visitor, causes their reaction, mobility or fatigue, so that severe luminous and rapidly changing light shades, even yellow, cause visual fatigue or nervousness for the visitor. The amount of general lighting should be such that excessive contrast is avoided. In cases where the increase or decrease in brightness is rapid and high, an adaptive or transitional intermediate zone should be provided so that the visitor will be able to get used to the new level of lighting. Contrast is needed to understand the environment, but it has to be cleverly set in the museum, so that in such a way that all objects and surfaces of the same size are seen in the purview, they

are lit in the same proportion as possible[13]. In museums, lighting is more than just shining light on objects only in order to make them appear. The brighter and darker parts inside the frame help to create the composition of each façade and in this way, they draw our attention to certain objects and actions. One part of the work that has received more light can draw the viewer's attention to an important point; in contrast, the shadow hides the details. Lighting helps to appear the textures of the artwork: Lines on a work, used decorations, delicacies, textures, brightness of a piece and so on. Also, Lighting forms the overall composition of the work. Lighting can also affect our sense of the shape and texture of the displayed objects. For example, if light shines on a historical round monument from the side, we will see a semicircle, and if light shines on it from the front, it will look round [10].

Designing Polygon Forms and Sharpness Inside the Museum

As a bulky form, this is one of the main forms in terms of visual perception. Polygon or pyramid has a special kind of duality emotionally. On the one hand, we feel the increasing mass of the pyramid becoming heavier from top to bottom. On the other hand, the higher we go, the more compact and interesting each level of the pyramid becomes. These two counterforces cause severe stress which makes the polygon or pyramid as one of the most active forms[11].

Using Materials Such as Glass, Exposed Concrete and Metal as The Broken Shapes in The Interior Architecture Facade.

Exposed concrete: It is considered a modern prefabricated concrete piece for the facade of modern and stylish structures in the construction industry. Exposed concrete induces a combination of simplicity and strength of structure to the viewer. With the use of exposed concrete in the interior and exterior, there is no need to use other materials for interior and exterior decoration.

Glass: The use of glass can be effective in reducing the weight of the building, increasing the executive speed of the facade, increasing the efficiency of natural light and reducing the need for electricity for lighting, increasing the visibility of building occupants, evoking a sense of beauty and cognition in building clients.

Creating A Landscape for The Audience in The Museum's Outdoor Environment

Creating a landscape in the museum's outdoor environment is one of the influential factors that can create freshness, vitality and a sense of belonging. Building a green space enhances the sense of socialism and leads to a productive life.

By using the green space design in the outdoor environment of the museum, the unattractive and rough face of the building becomes a delicate and pleasant

face and gives an amazing and beautiful effect to the museum horizontal view [23, 24]

RESEARCH METHOD

The present research is a practical study in terms of purpose. Moreover, in terms of nature, it is a correlational descriptive-analytical study that was done quantitatively by a survey method. Technically, data analysis is also a quantitative study with statistical analysis and the investigation is a cross-sectional study in terms of time. In this research, the survey method was used to validate the research data. The nature of the collected data is quantitative and is based on a structured questionnaire. Furthermore, the results were analyzed in the form of frequency distribution tables as well as statistical tests. A factor analysis was carried out with SPSS v.10.0 to identify the primary determining factors of satisfaction. The questions were divided into two main categories as follows:

1) the visitors' demographic features and 2) visitors' evaluation of the museum environments. The demographic features of the visitors consisted of gender, age, educational background and work experience. Then, visitors' evaluation of the museum environments was designed according to the following categories:

- Evaluation of the factors affecting social interactions in museum environments includes the following:
  - Perceptive factors
  - Practical factors
  - Objective factors
  - Conceptual factors
- The factors that affect the museum design are categorized as follows:
  - Physical environment
  - Emotional effects
  - Satisfaction of visitors

By using the 5-point Likert scale (1 ¼ ''very unsatisfactory'' and 5 ¼ ''very satisfactory''). The 5-point Likert scale was also used to measure the respondents' perceptions. Research questions are categorized into five options: very high, high, medium, low, and very low, (1 ¼ ''very low'' and 5 ¼ ''very high''), respectively. And the respondents in each case have chosen an option as their answer. These variables were considered as independent variables as described in this table.

Data Collection Method

In order to do a research study, a data collection tool is needed. Generally, these tools include questionnaires, interviews, observations, and documents. The library study, which reviews organizational documents and secondary documents, is the data collection tool for theoretical foundations of a research study. In the case of statistics data of the research, the questionnaire is used to identify the relationships between research variables (Brown, 1999). Additionally, in the present study, the method of investigating the opinion of experts and the standard questionnaire was used to collect data.

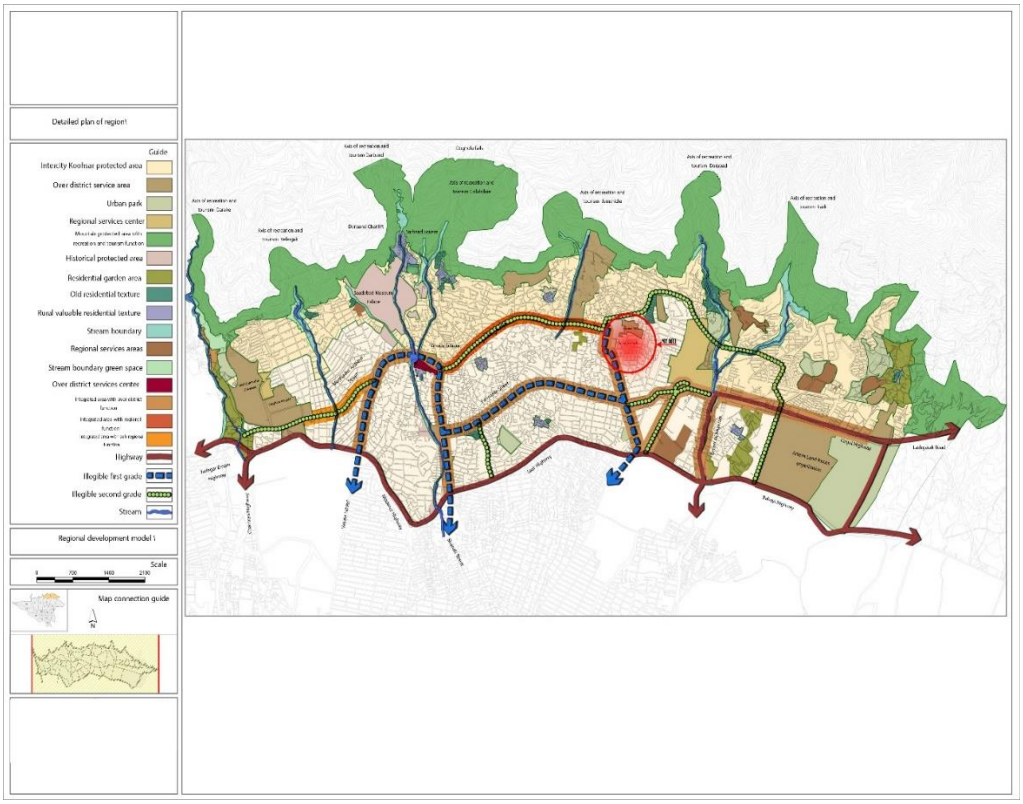
Population

The statistical society of the study included all experts and managers of design, architecture, and civil engineering companies in Tehran. Given the vastness of the statistical community and its uncertainty, the statistical sample consisted of 100 experts of this field, who were selected by a purposive judgment method and screened in terms of their familiarity with the subject of the research.

CASE STUDY: Sample Study of Tehran's District 1

Features of The District (Existing Situation)

In this part, the general features of the district including area, population, social, economic, and matrix and indexes, and structure of district division is analyzed and the statue of the district is presented with SWOT method.



Analysis of The Situation of The District:

Generally, features of the district has been analyzed with SWOT method and is summarized in following table:

Table 3 : *Conclusion Of Analysis Of Situation Of The District (Advantages, Disadvantages, Opportunities And Threads)*

Internal conditions		External conditions	
Advantages	Disadvantages	Opportunity	Thread
Existence of usages relevant to tourism and leisure time in the district	Shortage of facilities and welfare services in the district recreations	Tendency in investment in the district and possibility of leading such investment in tourism, recreational, and cultural sections according to the features and talents of the district.	Paying no attention to the capacity of lands, environment and resources in the selection of type and location of urban usages
Existence of historical and diplomatic areas in the district	Over density of the buildings of the district special in old textures	Possibility of designing and organizing recreational spaces in the district as main center of recreation and public memory of Tehran inhabitants	High growth rate of population than the whole city
Existence of interactive usages in main directions (Shariati and Valiasr) and creation of vivid in them	Not registering most of the natural, historical, cultural buildings and works	Determination of recreation and tourism role in Tehran comprehensive plan according to the potentials of the district 1	The increasing process of land and house price
Existence of mountains and valleys and natural views and corridors in	Impossibility of rendering appropriate services to high population due to tourism potential	Paying attention to and protecting green and natural space of the district in the overhand plans	Historical and cultural spaces are exposed to hazards due to not protecting them.

each district			

Perspectives of The District

The tendency for investment in tourism instead of housing in the district and conversion of the district to a natural tourism center of Tehran city and also cultural, historical, and diplomatic center of North of Tehran are some of the main perspectives of the district that is in the same direction with the perspectives of the comprehensive plan like conversion of Tehran to a green and beautiful city with different public spaces and a metropolis with national and global functions with a modern economy and centrality of cultural, research and political affairs in Iran. With the perspective of supplying urban services in the district, we can achieve the conversion of Tehran city to a smooth city with appropriate infrastructure and public welfare and a sustainable and coherent city with an appropriate structure for domiciling and activity and leisure time.

Stabilizing the united personality of district 1 (Shemiran area) as the optimized tourism, recreation of Tehran city, together with development of diplomatic (political) and international activities, preserve the function and matric pattern of the privileged residences and leading economic investment to the tourism section and supplying services in the district.

Table 4 *: Comparison Of The Perspective Of Development Of Tehran Metropolis And District 1*

Comprehensive plan	District	Examples
Tehran, a city with originality and Iranian and Islamic identity (a city for growth and development of human)	District one as the cultural and historical center	Determining the integrated width with cultural and historical usages
Tehran, a green and beautiful city with different public spaces	District 1 as a recreation and tourism center of Tehran	Organizing recreation usages around streams and valleys Preserving view to the mountain by controlling density
Tehran, a smooth city with appropriate infrastructure and public welfare together with adjustment of inequalities and fair supply of all citizenship rights	Supplying services in the district and leading economic investment to the tourism section	Offering recreational-tourism integrated areas
Tehran, a metropolis with national and global functions and with a modern economic and centrality of cultural, research and		

political affairs in Iran and at least of the three important and top cities in southwest Asia		

3D Modeling

Using 3D modeling such as Revit obviously changes the way of thinking and designing a museum. Digitization, more than any other factors, affects the ability to construct the museum experience, cognitive but also formative, telling stories, always new [6]. In Autodesk Revit, it is possible to create objects from imported meshes and create different aspect of museum management, including building structures, lighting and collections in order to indicate and compare these aspects for enhancing museum as cultural heritage [25].

DESCRIPTIVE FINDINGS

The demographics of the statistics sample are addressed as follows. Furthermore, the answers of respondents to the research questions are presented below.

Frequency Distribution of Respondents by Their Age

Table 5 shows the frequency distribution of respondents by their age, which is presented for six age groups. According to the results of the research, the highest frequency is related to the age group of 40 to 44 years including 22 people (22% of the statistical sample) followed by the age group of 25 to 29 years, 45 to 49 years, and 35 to 39 years.

Table 5: *Frequency Distribution of Respondents by Their Age (Reference: Author)*

	Frequency	Percentage of Frequency	Percentage of cumulative frequency
25 to 29 years	19	19.0	19.0
30 to 34 years	14	14.0	33.0
35 to 39 years	15	15.0	48.0
30 to 44 years	22	22.0	70.0
45 to 49 years	16	16.0	86.0
50 to 54 years	14	14.0	100.0
Total	100	100.0	

Frequency Distribution of Respondents by Their Sex

In the following table, the frequency distribution of respondents by sex is presented. According to the results of the research, of the 100 respondents to the research questions, 60 were men and 40 were women.

Table 6: *Frequency Distribution of Respondents by Their Sex (Reference: Author)*

	Frequency	Percentage of Frequency	Percentage of cumulative frequency
Male	60	60.0	60.0
Female	40	40.0	100.0
Total	100	100.0	

Frequency Distribution of Respondents by Their Education

The frequency distribution of respondents by their education is reported in table 7. The results revealed that most respondents had bachelor's degrees (37 persons), followed by 36 and 27 respondents with Master and Ph.D. degrees, respectively.

Table 7: *Frequency Distribution of Respondents by Their Education (Reference: Author)*

	Frequency	Percentage of Frequency	Percentage of cumulative frequency
Bachelor	37	37.0	37.0
Master	36	36.0	73.0
PHD	27	27.0	100.0
Total	100	100.0	

Frequency Distribution of Respondents by Work Experience

Table 6 represents the frequency distribution of respondents by work experience. Of all respondents, 27 were in the two groups of 5 to 10 and 11 to 15 years of work experience followed by 16 to 20 group with 19 persons.

Table 8: *Frequency Distribution of Respondents by Work Experience (Reference: Author)*

	Frequency	Percentage of Frequency	Percentage of cumulative frequency
Less than 5 years	17	17.0	17.0
5 to 10 years	27	27.0	44.0
11 to 15 years	27	27.0	71.0
16 to 20 years	19	19.0	90.0
More than 20 years	10	10.0	100.0
Total	100	100.0	

Data Normality Test

At first, the data skewness and kurtosis were calculated. Skewness is a measure of the symmetry or asymmetry of a distribution function. For a completely symmetry distribution, the value of Skewness is zero. The Skewness value for an asymmetry distribution with a trend towards higher kurtosis values is positive while for an asymmetry distribution with a trend towards lower kurtosis values, it is negative. Kurtosis shows the height of distribution; in other words, kurtosis is a measure of the curve height in the maximum point and its value for a normal distribution is 3. A positive kurtosis shows that the peak of the intended distribution is higher than the normal distribution whilst the negative value indicates that the peak of the intended distribution is lower than the normal distribution. For example, in the t-distribution, in which the scattering of data is greater than the normal distribution, the height of the curve is lower than the normal curve. After the results of the report were collected, to determine whether sample data were drawn from a normally-distributed population, the data of the columns of skewness and kurtosis must be investigated. If the values of the skewness column are between -3 and +3 and the kurtosis values are between -10 and +10, the set of data is normally distributed (Habibi, 2017).

Table7: *The Normality Test of Data Distribution (reference: author)*

Test		Std. Error	Statistic
x1	Mean	0.080	3.99
	Skewness	0.241	0.018
	Kurtosis	0.478	-1.423
x2	Mean	0.107	3.66
	Skewness	0.241	-0.506
	Kurtosis	0.478	-0.997
x3	Mean	0.068	3.96
	Skewness	0.241	0.049
	Kurtosis	0.478	-0.800
x4	Mean	0.061	4.34
	Skewness	0.241	-0.328
	Kurtosis	0.478	-0.634
x5	Mean	0.052	4.52
	Skewness	0.241	-0.299
	Kurtosis	0.478	-1.427
x6	Mean	0.090	3.85
	Skewness	0.241	-0.536
	Kurtosis	0.478	-0.366
x7	Mean	0.077	4.29
	Skewness	0.241	-.553
	Kurtosis	0.478	-1.100
x8	Mean	0.080	4.19
	Skewness	0.241	-0.358
	Kurtosis	0.478	-1.348

x9	Mean	0.081	4.07

Factors Effectiveness Test

One of the questions that were examined was whether the effect of each of the identified and confirmed factors that are influential in attracting the audience to museums is statistically confirmed or not. Hence, this hypothesis was investigated for all 17 identified factors using the one-sample t-test. The descriptive results of this test and the results of testing the effectiveness of these factors are reported in table 10. In each case, the mean, mean deviation, and standard deviation of the respondents' answers to the identified effective factors are presented.

Table 8: *Descriptive Statistics of Respondents' Answers to The Effectiveness of The Factors (Reference: Author)*

Factor's effectiveness test	Frequency	mean	standard deviation	Mean deviation
How effective is the building of cultural and social places such as museums near public places such as parks in order to attract audience?	100	3.99	.798	.080
To what extent is it necessary to have a museum as a cultural and social entity in society?	100	3.66	1.066	.107
How effective can pyramid and broken form designing be in attracting audience?	100	3.96	.680	.068
How much can the landscape of the external museum environment be effective in the process of rejuvenation and providing a sense of belonging to the environment?"	100	4.34	.607	.061
How important are the tall entrance and the sense of invitation in the museum?	100	4.52	.522	.052
How can designing separate and separable areas as galleries and exhibitions as well as the presence of artworks and elements contribute to the attraction and sense of invitation of a museum?	100	3.85	.903	.090
To what extent can the use of parametric design on the roof of	100	4.29	.769	.077

a museum have positive effects on audience?				
To what extent can the use of materials such as glass, exposed concrete and metal in the form of broken shapes in facades and interior architecture be attractive to the audience?	100	4.19	.800	.080
To what extent can the use of a luxurious, beautiful and wide lobby increase the beauty and attraction of the work?	100	4.07	.807	.081
How much does the holding the arts and creating a lively and dynamic sense in the landscape of the museum bring happiness to the audience?	100	3.96	.602	.060
To what extent is the designing of polygonal and sharp forms in the internal environment of the museum effective in moving spatial quality?	100	4.12	.769	.077
How much does using voids with polygon shapes on each floor of the museum increase the strength and beauty of the building's design?	100	4.14	.865	.086
How important can it be to improve the quality of space using the effects of light in the museum?	100	4.45	.500	.050
To what extent does the play of light and shadow (contrast) in the museum increase the spatial quality?	100	4.21	.946	.095

The one-sample t-test is used to test the hypothesis that the mean of a sample ($\bar{x}$) and the mean of the population (μ) with normal distribution are equal. The purpose of this test is to evaluate the equality of the average of the estimated sample ($\bar{x}$) with the average of the statistical population (μ). In the present study, the mean of the population was considered 3. In other words, if the difference between the estimated mean and 3 was significant, it is was concluded that the identified factor is significantly effective in attracting audience to museums. The results of one sample t-test for each factor are given in table 11. The effectiveness of all identified factors was confirmed based on the results and estimated significance level for t statistic value.

Table 9: *One-Sample T-Test for The Effectiveness of Factors. (Reference : Author)*

Test	Test Value = 3					
	T	df	Sig.	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Building cultural and social places such as museums near public places such as parks	12.141	99	0.000	0.990	0.83	1.15
The existence of a museum as a cultural and social entity in society	6.193	99	0.000	0.660	0.45	0.87
Designing broken forms and pyramidal shapes	14.108	99	0.000	0.960	0.82	1.10
Providing a landscape for the audience in the museum's external environment	22.087	99	0.000	1.340	1.22	1.46
Tall entrance with the sense of invitation	29.127	99	0.000	1.520	1.42	1.60
designing separate and separable areas as galleries and exhibitions as well as the presence of artworks and elements	9.412	99	0.000	0.85	0.67	1.03
Using parametric design for the museum ceilings	14.652	99	0.000	1.290	1.14	1.44
Using materials such as glass, exposed concrete, and metal as the broken shapes in the interior architecture facade	14.871	99	0.000	1.190	1.03	1.35
Using a wide luxurious lobby	13.255	99	0.000	1.070	0.91	1.23
holding the arts and creating a lively and dynamic sense in the landscape of the museum	15.955	99	0.000	0.960	0.84	1.08
Designing polygon forms and sharpness inside the museum	14.562	99	0.000	1.120	0.97	1.27
using voids with polygon shapes on each floor of the museum	13.182	99	0.000	1.140	0.97	1.31

Improving the quality of space by taking advantage of the effects of light in the museum	29.000	99	0.000	1.45	1.35	1.55
The play of light and shadow (contrast) in the museum	12.791	99	0.000	1.210	1.02	1.40
Transmission of natural light through the ceilings into the museum environment	288.361	99	0.000	1.480	1.38	1.58
Functional-based and artistic use of natural light from glass ceilings during the day	17.331	99	0.000	1.220	1.08	1.36
Using proper lighting in the outdoor environment	13.913	99	0.000	1.130	0.97	1.29

Ranking Factors

The average rank of each factor and the final rank of each factor compared to other factors are presented. The average ranks of the 17 factors of the questionnaire were different so they were prioritized from the highest to the lowest one in the column of rank. Although the mean rank of these factors was different, the difference is significant only if the results of the Friedman ranking test are significant. The results of the significance value of Chi Square in the Friedman ranking test as well as the significance level were presented in table 12.

Table 10: *Mean Rank and Effective Factors Ranking of Friedman Test (Reference: Author*

Ranking effective factors of Friedman test	Mean rank	rank
Building cultural and social places such as museums near public places such as parks	7.93	13
The existence of a museum as a cultural and social entity in society	6.79	16
Designing broken forms and pyramidal shapes	7.80	14
Providing a landscape for the audience in the museum's external environment	10.00	4
Tall entrance with the sense of invitation	11.11	1
Designing separate and separable areas as galleries and exhibitions as well as the presence of artworks and elements	7.47	15
Using parametric design for the museum ceilings	9.64	6
Using materials such as glass, exposed concrete, and metal as the broken shapes in the interior architecture	9.35	7

facade		
Using a wide luxurious lobby	8.49	12
holding the arts and creating a lively and dynamic sense in the landscape of the museum	7.47	15
Designing polygon forms and sharpness inside the museum	8.80	11
Using voids with polygon shapes on each floor of the museum	9.01	9
Improving the quality of space by taking advantage of the effects of light in the museum	10.68	3
The play of light and shadow (contrast) in the museum space	9.67	5
Transmission of natural light through the ceiling into the museum environment	10.80	2
Functional-based and artistic use of natural light from glass ceilings during the day	9.18	8
Using proper lighting in the outdoor environment	8.87	10

CONCLUSION

The results reported in table 13 indicated that the Friedman Ranking Test for ranking the effective factors is significant based on significance level Sig = 0.000 so the difference observed in the mean rank is significant. Thus, it is concluded that from the research experts' viewpoint the ranking of effective factors is different in terms of importance and effectiveness and this difference is noticeable. Therefore, it can be said that among the 17 factors, the five top-ranking effective factors according to experts are as follows:

- Entrance with high height and inviting feeling.
- Passing natural light through parametric and polygonal roofs into the museum environment.
- Improving the quality of space by taking advantage of the effects of light in the museum.
- Light and shadow play (contrast) in the museum space.

Table 11: *Results of Friedman Test for Ranking Effective Factors (Reference: Author)*

Friedman Test	
Frequency	100
Chi Square Statistic	119.160
Degree of freedom	16
Significance level	0.000

In this research, the effect of physical elements of the museum as a public place on its sociability individually and in the combination of each other was investigated. Moreover, the influence of some social-psychological factors on sociability was measured and their effect was proven. The results indicated that the physical features of the museum architecture and the type of social interactions in the place are influential in sociability. In other words, these

features are remarkably effective in increasing interactions from the audience's viewpoint and this is a sign of the high sociability of the place. Correlation analysis showed that there was a relationship between these spatial elements and their characteristics with the social interactions between audiences in the museum. A significant relationship was found between physical characteristics such as the material, shape and form of the walls and ceiling as well as the geometric shape of the plan and space with the social interaction and durability of its contacts. This significant relationship leads to a longer ~~time that visitors~~ stay in the place and increases the possibility of forming interpersonal and transpersonal relationships. Variable or dynamic elements of the place, such as the presence of adequate natural light are important features of a place encouraging its users to stay longer in the place and increase all their interactions.

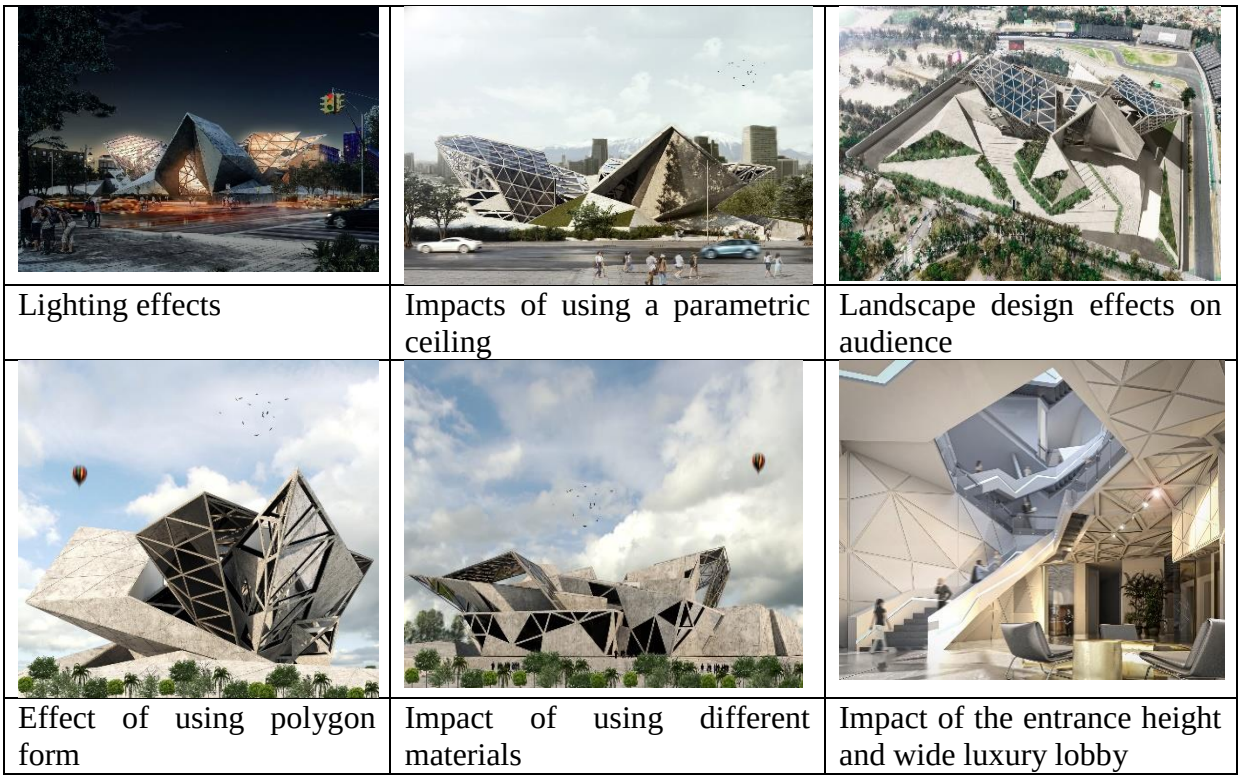


Figure 2 : *3D Modeling of Different Factors in Designing Museum*

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