



# The Influence of Humanism and Ergonomics to Assess Environmental Quality on Users' Satisfaction in Railway Station of Tehran

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**ABSTRACT:** Today's, the characteristics of architectural space is important in determining the quality of human life while most attention of architects and urban planners is on areas and sites which have a high level of social activity. Among these sites, railway stations are utmost important in creating appropriate context to communicate and attract a huge number of audiences. Scientific researches show that in designing "collection of human-oriented railways" a comprehensive approach has not achieved yet; Although, the solutions proposed in the past can be an appropriate guide to develop current projects. Present study reviewed and identified indicators of environmental quality and satisfaction, then it tested the components of the ergonomics which act exactly in line with improvement of environmental quality in accordance with the human aspects' standards. The study then will measure the satisfaction of users from the railway station in Tehran according to these components. For this purpose, by Cochran formula, a sample of 165 subjects of the study population was selected by stratified random sampling. Instrument was a 38-questions questionnaire which was validated by the researcher and then completed by travelers, service staffs and residents of the complex. ANOVA test results showed that the average satisfaction of service staff is lower than other groups. Moreover, the results of multiple regression analysis showed that physical factors with standard index of 0.251 (compared to other factors), has the greatest impact on satisfaction of users from our studied railway station, in Tehran.

**Keywords:** Satisfaction, Environmental Quality, Ergonomics, Humanism, Railway Station Complex.

## INTRODUCTION

Environmental quality emerges from constituent elements of a region however it is always more than just the sum of elements; environmental quality is the full perception of a location. Each constituent element (nature, outdoor, infrastructure, built environment, facilities and the natural environment resources) owns its specific characteristics and relative qualities. Lack of required methods for improving architecture of railway station will cause failure to respond to ever-increasing human needs and his space activity in this complex; therefore, this question arises in mind that which indexes and human principles are missing in architectural spaces and environment of the railway station. Indicators such as the way of communication and coordination of railway complex with the adjacent buildings, traffic level of comfort, safety and visual quality for citizens, adjacent buildings residents and users of the central services

are the most important human principles that should be considered in architecting the space of the railway station. Today's, lack of humanitarianism and civilization-oriented architecture of railway stations and a developed system, is quite obvious. One reason for lack of such potential environments can be caused by lack of attention to ergonomic designing in these environments and in the other word, necessary criteria are not taken into account to create areas that are appropriate for human conditions. The subject of life's quality has attracted a lot of attention in recent years. The study of this concept has been done based on the acceptance of fundamental hypothesis saying that the social and physical environment can affect the happiness and well-being of people living in that area (Limber, 2006, p. 1). In this research, for harmonizing human relations and environmental elements, a balanced charter has been considered in line with satisfying the

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exploiters of the complex. Productive utilization of rail transport after construction of the station's architectural environment, requires coordination and integration of complex's components such as individual and collective management art; In a way that finally, the conditions of the ergonomic designing process can be realized. The writer seeks to investigate some problems in the environments and spaces in which the fitting and suitability of human conditions is not considered whether in their designs and management which consequently causes audiences' dissatisfaction.

## LITERATURE REVIEW

Literature review is a critical study of the previous researches which help future scholars expanding their insight. In the following section, some sources related to the subject matter of the research will be discussed.

Gutnof (1990) in a book named "The Architecture World, City Face" emphasized that the environmental structure of railway station's complex can benefit from a considerable diversity with a variety of approaches; Like the formation of architectural spaces with a humanitarianism and human-centered approach. And the areas adjacent to the railway station with rail lines, can dominate the city structure and demonstrate a new and modern level of development according to the viewpoint and view of Gutnof and Canoni Nokoova (Gutnof, 1990, p. 350). These scholars point to the need to re-evaluate urban potential performances that have been influenced by the formation of railroad regions. The creation of railway areas should be considered as an important component of urban plans which can be helpful for reorganization of residential and industrial areas, development of nature-oriented complexes and green space, improvement of transport infrastructure and preservation of historical and cultural heritages. Abramof S.B. (2008) in "Railroad Transportation" defines the railway stations as a multifaceted complex in which the development of urban space is due to the growth in number of passengers at the rail transport. This development in turn accompanies the population growth and increases the mobility level of citizens in the railway complex (Abramof, 2008, p. 10). Victor Pavlovich Mironenka (2006) in the "Modern Railway and Development of the Railway Station Complex Process" emphasized that the greatest problem we encounter in urban environments are caused by the negligence of humanitarianism in designing; in addition to physical separation, it is the visual separation of people from their living environment that creates a sense of

alienation and consequently spiritual, psychological and emotional disturbances. These days, many buildings have lost their human scale and organizing the scale and size of modern cities are against human beings. In spite of efforts that have been done to preserve the physical aspects and shape of urban environment in recent years, simultaneously and continuously, spaces with larger scales are organized to act as an opposite point of emotional and aesthetic sense of human (Mironenka, 2006, p. 18). In 2008, Irina Vladislavova Derval, in her article entitled "Environmental Aspects of Architecture and Urban Planning in Frame of Communication Elements' Formation in Urban Communication Environments", conducted a research to solve the problem of creating a comfortable and unobstructed environment in urban level and proposed creating a continuous special route for convenient and secure transportation of specific groups of people from their residence to their destinations, using public services and collective communication spaces. It in turn provides a potential contribution to individual mobility and social interactions of individuals (Dreval, 2008, p. 192). Wilson and Yario (2015) emphasized the need for attention to human aspects in designing the railway stations in an instruction entitled "Railway station designing principles". They also stated that the safety and health of users in railway stations are influenced by appropriate design of the equipment, work processes, environment and facilities used by users. So, it is necessary to consider issues such as project review by ergonomic specialists when designing these stations (Wilson et al., 2015).

In domestic resources, no research was found in which the researcher directly addresses the humanitarianism and ergonomic effects of environmental quality on the satisfaction of users at the railway station complex; therefore, researcher investigated previous researches related to architectural and human-centered spaces; some of these resources are as follows:

Zamani, Saremi, and Tizghalam Zenori in an article entitled "Reviewing the Human Needs for Creating Appropriate Architectural Spaces" in 2013, explains that designing urban spaces appropriate for needs of human beings and individuals using those places, is one of the main issues in the field of urban architecture and designing, and many studies and efforts are required to determine the factors affecting the design of spaces which meet human needs and expectations. Therefore, in this paper, presented models are proposed by several theorists in the field of human needs in order to determine the importance of this issue. With respect to the studies and library researches which has been carried out and



examining these models, the complexity and dependence of these needs in determining human activities or the performance of architectural spaces can be achieved. The results show that in these models, performance which is based on human needs contain different social and psychological aspects at any moment (Zamani et al., 2013). Shaghaghi, Tizghalam Zenori and Talaee (2013) reviewed the scientific and practical foundations of human aspects affecting the quality of places made by human as well as emphasized on the workplace and life environment, and the way community-accepting and community-escaping spaces are formed. They also reviewed predicting behaviors in a space considered as important factor in designing and understanding and creating architectural space. we all have memories, both positive and negative, in which they use understanding and contemplation of the experiences that we have taken from each space. Therefore, it is concluded that the interaction between form, life and balance in private and public spaces, their efficiency in micro and macro scales, and also paying attention to collective life, all features of spaces and place of life are among important aspects of environmental and social systems (Amirshaghaghi et al., 2013).

## **THEORETICAL FRAMEWORK OF RESEARCH**

### ***Human Needs and its Impact on the Environment***

Since human contains two components of physical and spiritual, his needs are also divided into these two categories. The purpose of physical needs is to achieve the welfare while the purpose of spiritual needs is to gain felicity. Seeking for meeting his physical and spiritual needs, human manipulates the environment. The scope of this manipulation primarily depends on the recognition and extent of his knowledge of the environment (Norouzian et al., 2001, p. 3). Human desires for growth, self-development, self-respect and respect from others, being belonged, safety and security, stability, and physical requirements. Humans not only try to save “themselves”, but also strive to direct themselves towards integrity, unity, perfection and autonomy. Human has the capacity, talent, and required motivation to solve his problems. Although the tendency to self-actualization has a biological origin, it has been proven that the growth of this desire is also influenced by culture and the surrounding environment.

Another point is that human is not driven by all needs at the same time. At one time only one need is prevailing. What this need is depends on which one or which group of other needs has already been met (Karimi, 1995, p. 156). Human needs change over time. Due to the evolution of needs, changes occur in the functions of the environment. Since the performance of the environment is a function of human needs, changes in performances make changes in the bodies. Therefore, on one hand, human is influenced by the environment and, on the other hand, he organizes and transforms the environment according to his needs, values and goals.

### ***Environmental Quality***

Environmental quality can be considered as one of the most important concerns of architecture and designing knowledge. This is so that many theorists consider “improving the quality of the environment” as the most important task of urban and architectural design activity (Pakzad, 2016, p. 77). In theoretical texts, there are several definitions of the quality concept of the environment. These different perceptions are shaped based on the thinking field of the experts or the way they selected indicators. Therefore, the lack of a comprehensive, precise, and consensual definition of the concept of the quality of the environment reveals itself to how different indicators are chosen from their side. This can be due to the linkage or overlap of this concept with other vague and complex concepts such as quality of life, living ability, and sustainability (Van Kamp, 2003, pp. 5-18).



**Table 1. Definition of Environmental Quality from the Perspective of International Researchers and Associations**

The Concept of Environmental Quality	Researcher
A high quality environment brings a sense of well-being and satisfaction to individuals through indicators that may be physical, social, or symbolic.	Lansing and Marans (1969)
Environmental quality is a complex subject including abstract perception, the way of thinking and values that vary among individuals and groups.	Portcous (1971)
The quality of the environment is due to the quality of the constituent elements of an area but something more than the sum of the elements, the quality of the environment is the perception of the place perfectly and completely. Constituent elements (nature, open space, infrastructures, built environment, natural facilities and resources) each have their own characteristics and relative quality.	RMB (1996)
Environmental quality can be defined as the main part of the wider concept of quality of life, such as the basic qualities like health and safety in combination with aspects such as comfort and attractiveness.	RIVM (2002) Workshop Livability (2002)

(Van Kamp, 2003, p. 7)

**Table 2. Components of the Environment Quality**

Quality Components	No
Permeability, Activity, Safety and Security, Comfort and Convenience, Compatibility, Control and Supervision, Flexibility, Access and Communication, Variety of Uses, Perception, Chat-Use And Form), Hierarchy.	Functional Component 1
Natural, Artificial (Visual Fit), Riches. Visual Pleasantness, Readability, Durability, Sustainability, Sensory Richness.	Physical Component 2
Concrete, Conceptual.	Component of Meaning (Identity) 3

(Yazdani, 2010)

### ***Indicators and Criteria Affecting Citizens' Satisfaction from Urban Public Spaces***

In recent years, several studies have been carried out on indicators of improving the quality of the environment. One aspect of these studies is paying attention to human-environment interaction. To this end, measuring people's level of satisfaction from the environment is important (Houriland, 1984, p. 370). The issue of satisfaction and assessment of environment has been examined from different perspectives. Environmental assessments are of interest for two aspects of human and the environment; Satisfaction is measured based on assessment of physical indicators or the quality aspects of the environment.

Urban space and its relationships are interconnected affected by each other. Through social-cultural relations, human gives form, function, and importance to the space and organizing the space leads to the transformation of these relationships. Therefore, construction and design of urban spaces affect the process of social life and should be physically and psychologically efficient for citizens (Rafiyani et al., 2005).

Satisfaction measurement is achieved not only based on concrete environment but also on the perception of individuals from the environment to which they belong. Generally, using a combination of concrete and conceptual indicators in research process is necessary. Conceptual indicators make it possible to become aware of the level of well-being / satisfaction of individuals, as well as what is considered important by people. Concrete indicators are required to measure those aspects of the environment that are difficult to assess. These indicators are considered a point of departure for environmental policy-making and are the guarantees of conceptual criteria's credit (Van camp et al., 2003).

Hilder Brandfery explained the following characteristics as the conditions for having a high level of satisfaction with the city environment:

- Urban space should have safety, security and protection, and be a well-organized, orderly and clean environment from visual and functional perspective.
- Urban space should include physical elements and coherent activities.



- Social environment must be guiding and strengthen the sense of place.
- It must have an appropriate mental image, good reputation and credit and give people a sense of trust and dignity.
- It should give the opportunity to people to be creative, to shape their own personal space and to express themselves.
- It must be designed to be aesthetically pleasing and physically imaginable (Brandferly, 2004, p. 30).

Bentley. E. (1985), in his book “Answering Environment”, mentioned seven criteria for assessing the quality of urban environments:

- **Permeance:** means creating different accesses in an environment.
- **Diversity:** means maximizing the diversity of uses from places and the function of different spaces.
- **Readability:** Readability is the quality that makes the environment accessible, and it has two levels of physical form and activity patterns.
- **Riches:** means places be used for different purposes and give users the chance to make more choices from space.
- **Visual Requirements:** Visual conditions that social groups interpret from one environment according to their environmental experiences, their desires and goals.
- **Prosperity, breadth or plenty**
- **Personal Perceptions:** The clarity of the spatial pattern of activities for individuals that can clarify the way people use each space and place (Bahraminejad, 2003, pp. 81-82).

One of the factors that promotes the quality of urban space is a sense of place. Sense of place means the mental perception of people from the environment and their more or less conscious emotions from their environment that places the person in relation to the environment, so that the individual’s understanding and feeling are interconnected and integrated with the semantic context of the environment. This sense is the factor that transforms a space into a place with special sensory and behavioral characteristics for particular individuals. The sense of place makes you feel comfortable in a clean and orderly environment, feeling secure, enjoying and emotional perception, supporting the people’s interests in cultural concepts, supporting social and cultural relationships of the community, recalling past experiences, achieving identity, and thus causes benefiting better from the environment, user satisfaction, feelings of belonging to

the environment and its continued presence (Falaha, 2006). According to a study by the PPS Institute on more than 1000 public urban spaces in different countries of the world, the researchers concluded that there are four main factors in assessing qualitative desirability of urban public spaces’ condition which are: comfort and the perspective; uses, activities and being social-acceptance (Sifae, 2005).

### *The Study Area*

The city of Gorgan located in Golestan province-Iran, has been selected as a case study for the study of building façade preference. Gorgan is located between 54 degrees 13 minutes to 54 degrees and 45 minutes east longitude and 36 degrees and 31 minutes to 36 degrees and 59 minutes north latitude, in the southern part of Golestan province. The city is bounded from the north to the city of Aq Qala, from the south to Semnan province and the Alborz dynasty, from the east to the city of Aliabad Katoul, and from the west and northwest to the Kurdoki and Bandar Gaz cities. The area of this city is 16152 square kilometers while its height is 36.49 meters above sea level. The population of this city in 2011 was 536 329 and the area of the new city is 3676 hectares. In addition to neighborhoods of historical context, the city has neighborhoods that are completely new or integrated from both contexts. In this paper, most of the construction facades selected for photography are often located on the streets of Gorgan Pars, Golshahr and Naharkhoran Blvd, which include newly built buildings. They can properly demonstrate the weaknesses and strengths of the current approach in design of building facades and their impact on urban landscape quality. The location of Golestan province in the country, Gorgan city in the province and the mentioned streets are delineated in the following map as Fig. 3.



**Table 3. Indicators Effective on Environmental Quality from the Experts Point of View**

Falahat, 2006	Yazdani, 2010	Instutute PPS	Bentley.E	Hilder Brandfery	Indicator
Supporting Social and Cultural Relations of Society	Pleasantness/ Durability	Being Social-Acceptance	Personal Perceptions	Guiding Social Environment	Being Social-Acceptance
Feeling of Security	Security/ Control and Supervision	-	-	Safety, Security and Protection	Safety and Security
Pleasure and Emotional Perception	Visual Pleasantness, Readability, Durability	-	Visual Requirements/	Appropriate Sense of Place and Mental Image/ Good Reputation	Charm
-	Access	-	Personal Perceptions Permeability	An Organized and Orderly Environment	Access
-	Flexibility/ Activity Diversification	-	Visual Requirements	The Guiding Social Environment/ the Opportunity to be Creative, Aesthetically Pleasing and Physically Imaginable	Vitality and Dynamism
Feeling Comfortable in a Clean and Orderly Environment	Cleanliness	Comfort	Readability	Well-Organized, Orderly and Clean Environment	Comfort and Hygiene
Supporting the Cultural Concepts which are Important for People	Activities	Uses and Activities	Prosperity, Wealth and Riches	Including Physical Elements and Coherent Activities	Physical Elements Function and Activities

By combining planning ideas, urban and architectural design activities and taking into account the indicators that have been emphasized by the scholars, we consider

a number of factors contribute to the assessment of the public space quality:

**Table 4. Indicators Affecting the Satisfaction of Environmental Quality with Regard to Mentioned Theoretical Literature**

Indicators Affecting the Satisfaction of Environmental Quality	
Vitality and Dynamism Physical	Social-acceptance Access
Elements Function and Activities	Charm
Safety and Security	Comfort and Hygiene

**Ergonomics**

In this section, the data obtained from the photo quErgonomics or human factors engineering is a combinational science that seeks to design tools, devices, and the environment in accordance with physical and mental abilities and human constraints and interests. This science is formed to increase productivity, with

regard to the health, safety and welfare of humans in the environment. This science is also trying to fit the environment with humans instead of aligning humans with the environment (Sandres, 1998). The official definition of ergonomics approved by the IEA’s International Ergonomic Association, states that ergonomics (human factors) is the scientific principles related to the understanding of the interaction between



man and other elements of a system and profession that includes theories, principles, data and methods for designing optimization of the comfort and welfare of individuals in accordance with system performance (IEA, 2014).

**Ergonomic Architecture Environment**

According to Mironenka, formation of an architectural environment based on ergonomics principles has provided the ground for the high level of human performance and

his physical activity without any pressure in the fields of safety, security, emotional and sentimental functions, psychological and physical functions, and comfort for all groups of people living and commuting in that area (Mironenka, 2009, p. 240).

The relationship between humans and the environment is examined based on two basic principles of man and the environment (space):

- 1- Human attributes
- 2- Environment features

**Table 5. Human and Environment Components**

<b>Size and body dimensions, physical strength</b>	<b>Physical</b>	<b>Human</b>
Cardiovascular and Respiratory System	Physiologic	
Perception, Memory, Awareness, Experience, Information Processing	Mental	
Access, Communication, Light, Sound, Environment, Aesthetic, People Satisfaction with Railway Station Complex		<b>Environment</b>

(Dreval, 2008, p. 201)

Various people are different in dimensions and physical size. Ergonomics evaluates and measures these features and uses the results to better fit the human and the environment. The architectural humanitarianism's needs and prerequisites in railroad station complex environment is different in various countries, and this difference is due to the domination and prevalence of users' hierarchy needs level from complex's service and especial needs such as comfort, convenience, safety, information and social communication. Particularly the

level of service glassiness for people with disabilities and low mobility is very important. In Ebn-e Ali Heidari research, the components of ergonomic science which provide a humanitarianism environment during the design process, has been identified. Therefore, the high level of social dynamics and humans physical activity, with the least pressure, is the most important goal of the humanitarianism environment architecture. Among these components are the following diagrams (Heydari, 2015).

**Table 6. Ergonomics Components**

<b>Ergonomics Components in Urban Spaces from Heidari's View</b>	
Providing Service	Communications
Safety	Readability
Hygiene	Social interactions
Access	Aesthetic
	Vitality

(Ebn-e Ali Heidari, 2015)

**Humanitarianism and Ergonomics on User Satisfaction in the Railway Station Complex in Terms of Environmental Quality**

The theoretical framework is a conceptual model based on theoretical relations among a set of factors that is recognized as important about research issues. This

theoretical framework proceeds logically by examining the research background in the realm of the problem.



**Table 7. Final Indicators of Measuring the Effect of Humanitarianism and Ergonomics on Satisfaction of Users in Terms of Environmental Quality**

Theorists									Indicators
Ergonomics and Humanitarianism		Satisfaction with Environmental Quality							
Ebn-e Ali Heidari, 2012	Derval, 2008	Francis Tibalds 1992	Green, 1992	Saut Worth	Jacobs and Opliard 1987	Bentley.E et al., 1985	Hilder Brandfery	Kevin Linch,1984	
✓		-	✓	✓	✓	-	✓	✓	Safety and Security
✓	✓	✓		✓	-	✓	✓	-	Readability
✓		✓		-	✓	-	✓	✓	Providing Service
	✓	-	✓	-	✓	-	-	-	Physical Factors
✓	✓	-	✓	-	✓	-	✓	-	Vitality
✓	-	-	✓	✓	-	-	✓	✓	Hygiene

In this study, considering the quality indicators extracted from the theoretical foundations of satisfaction with environmental quality and ergonomic components in the table above, common and repeated indicators between these two concepts as the final indicators of measuring ergonomic effects on users' satisfaction at

station stations Railway complex based on environmental quality has been extracted to prepare the questionnaire and analyzing the data. These indicators, as presented in Table 8, include: physical factors, readability, vitality, providing service, safety and safety and hygiene.

**Table 8. Final Indicators of Measuring Ergonomic Effects on Satisfaction Rate in the Railway Station Complex from the Perspective of Environmental Quality**

Final indicators Extracted from the Shared Parts of the Two Mentioned Categories of Indexes
Physical Factors
Readability
Vitality
Providing Service
Safety and Security
Hygiene

## INTRODUCING THE SPACE OF TEHRAN RAILWAY STATION COMPLEX

The building the railway station is related to the first Pahlavi era, which is located in south of the Rah Ahan square in Tehran. This building has been registered on March 20, 2000 under the registration number 3639 as one of the national works of Iran. The construction of the Railway's Central Station was built using the idealistic expressionist approach inspired by the greatness and glory of ancient Iranian architecture. The entrance of the

central station is wide, and this rhythm is clearly repeated in windows, openings, and walls transverse pier. The station is made of iron and cement from the foundation to the ceiling and its windows are bronze and iron. Its outer face is made of white travertine stone, which has been extracted from the Pole Sefid mine. About 30,000 square meters of the total area of Tehran station is devoted to the passenger station including a waiting room and five passenger platforms (Saifa, 2005).

The most important step in this research is the analysis of scientific resources in architecture and



urbanization focused on railway station complexes and their features, ergonomic architecture, occupied spaces, examining these situations visually, environmentally, socially and psychologically, and recognizing these stations' components and elements. the results will provide solutions for organizing the functional space and improving the quality level in components mentioned in the railway station complex.

In terms of dimension and spatial aspect, the elements and components of building in Tehran railway stations include the following buildings:

- Passenger's building
- Public service building
- Recreational outdoor space
- Transport communication space:
  - On ground
  - Under ground
- Pedestrian communication space:
  - Overland
  - By air
  - Underground

The questionnaires were designed for passengers building, public services building and recreational outdoor space in the railway station complex of Tehran. The purpose of this research is to investigate the extent to which the users of the railway station will be satisfied in a case of considering the indicators related to ergonomics and environmental quality in these spaces (regardless of how much these principles are already being observed). Moreover, this study will explore which of mentioned indexes are more important for users.

### FINDINGS

In this study, a researcher-made questionnaire (after ensuring its validity and reliability) has been used to measure the effective factors on the users' satisfaction of railway stations. To ensure the reliability of the questionnaire, after doing the preliminary study, using the SPSS software, the coefficient of reliability of Cronbach's alpha for the whole questionnaire was 0.936, which indicates that the questionnaire has the appropriate reliability. The results are presented in Table 9.

**Table 9. Cronbach's Alpha Coefficient of Research Components**

Cronbach's Alpha Coefficient	Questions	Number of Questions	Components
0.864	1-10	10	Physical Factors
0.810	11-14	4	Readability
0.779	15-19	5	Vitality
0.730	20-26	7	Providing Service
0.766	27-33	7	Safety
0.752	34-38	5	Hygiene
0.936		38	Total Questionnaire

In order to investigate the existing conditions of physical factors, readability, vitality, providing service, safety, security and hygiene indicators at the railway station complex of Tehran and whether these indicators are currently being observed in the railway or not, one-sample t-test was used.

The statistical hypothesis of the single-sample t test is as follows:

$H_0$ : Indicator is observed in Tehran Railway Station Complex.

$H_1$ : Indicator is not observed in Tehran Railway Station Complex.

If the significant level is greater than the error value

of 0.05, there is no reason to reject the zero hypothesis and if the value of the significant level is smaller than the error value of 0.05, then the hypothesis 1 is the result. According to the information given in table 2, readability and safety indicators- in which their significant level is greater than the error value of 0.05- zero hypothesis is confirmed. It means that from users' perspective, Tehran railway station complex is readable and safe however, meaningfulness of other indicators which are less than 0.005, makes us to conclude that the users are facing problems.



**Table 10. Single Sample T-Test Results for the Research Components**

Test Result	Significance Level	The Statistics of Z	Research Components
Rejected	0.002	0.813	Physical Factors
Confirmed	0.064	1.313	Readability
Rejected	0.0031	0.865	Vitality
Rejected	0.0042	0.864	Providing Service
Confirmed	0.516	0.817	Safety
Rejected	0.0019	1.028	Hygiene

In the next step, ANOVA was used to measure the level of satisfaction for four groups of passengers, employees, residents around the complex and service staff. In Table

3, the descriptive characteristics of these four groups are presented.

**The Descriptive Characteristics Table of Users' Satisfaction Variable**

Number	Mean	The Standard Deviation	Group	Component
107	12.1463	3.5401	1	Users' Satisfaction
30	12.3233	3.271	2	
21	12.3952	3.929	3	
7	7.8571	2.1157	4	
165	12.0282	3.581	Total	

To compare the mean of these four groups, one way analysis of variance was used which you can see the

results in Table 4.

**Table 11. One Way Analysis of Variance to Compare the Means**

Significance Level	F	Mean of Squares	Degrees of Freedom	Sum of Squares		Variable
0.017	3.499	42.906	3	128.718	Intergroup	Users' Satisfaction
		12.263	161	1974.331	Intragroup	
			164	2103.049	Total	

As shown in the above table, there was a significant difference between the satisfaction of those four groups at the error level less than 0.05, so the zero hypothesis

is rejected and investigator's hypothesis is confirmed. To compare the groups, Tukey's follow-up test is used and results can be seen in Table 5.

**Table 12. Indicator's Related to Tukey's Test: The Difference in User Groups' Satisfaction**

The Significance Level	Standard Deviation Error	Difference of Means	Groups	
0.995	0.7234	- 0.1778	2	Group (1)
0.991	0.8358	- 0.2490	3	
0.011	1.3662	4.2891	4	
1	0.9963	- 0.0719	3	Group (2)
0.015	1.4699	4.4662	4	
0.018	1.5283	4.5381	4	Group (3)



As shown in the table above, there is a significant difference at the error level less than 0.05 between the first and fourth, second, and fourth, third and fourth groups. Regarding to the descriptive characteristics table, the fourth group received fewer grades than the other three groups. There was no significant difference between mean scores of other groups in the level of error less than 0.05. Regarding Table 6, it can be expressed that there is a positive and significant relationship ( $r = 0.461, 0.427, 0.450, 0.486, 0.451, 0.935$  and  $p = 0.000$ ) between users'

satisfaction and independent variables (physical factors, readability, vitality, providing service, safety and hygiene). This means earning a high score on those factors results in a higher score in users' satisfaction. Among the above mentioned factors, strength of the relationship between Physical Factors and Hygiene ( $p = 0.000$  and  $r = 0.935$ ) is more than other factors. Comparing other factors, this factor has a greater effect on dependent variable (users' satisfaction).

**Table 13. Correlation Coefficient Between Independent Variables with Dependent Variable**

Users' Satisfaction	Variables	No.
*0.935	Physical Factors	1
*0.451	Readability	2
*0.486	Vitality	3
*0.450	Providing Service	4
*0.427	Safety	5
*0.461	Hygiene	6

**\*P = 0.000**

In addition to the correlation analysis, multiple regression analysis has also been used to determine the share of each variable in predicting user satisfaction. One of the preconditions for using regression to check the relationships between variables is the existing of errors' independence. In this study, Durbin-Watson test was used to check the independence of errors and its value was 1.7. If the value of this test will be in the range of 1.5 to 2.5, it indicates the independence of the errors (lack of correlation between the errors) (Momeni and Fa'al Qayoumi, 2010, p.129). Regression analysis was performed in two steps when it was certain that there is lack of correlation between errors. In the first stage, all six independent variables of the research entered the regression equation. Multiple regression analysis results of users' satisfaction are shown in Table 7. The findings of the first stage show that physical factors, vitality, providing service and hygiene at a probability level of less than 0.05 ( $p < 0.05$ ) are a significant predictor of users' satisfaction in railway stations. This implies that respondents with a high level of satisfaction have reported high importance for physical factors, vitality, providing service and hygiene. The study of standardized value of the coefficient shows that Physical Factors are the strongest predictor of users' satisfaction ( $Adj R^2 = 0.158$

and  $F_{6,159} = 10.301, p < 0.001$ ). At this stage, regression analysis explains 15.8% of users' satisfaction variance while the most important part (25.1%) of this explanation is physical factors.



**Table 14. Multiple Regression for Users' Satisfaction**

Users' Satisfaction						Variables
Second Stage			First Stage			
P	Beta	B	P	Beta	B	
0.001		3.35	0.003		1.95	Constant Value
0.000	0.281	0.138	0.000	0.251	0.120	Physical Factors
			0.316	0.110	0.51	Readability
0.003	0.148	0.091	0.049	0.13	0.058	Vitality
0.001	0.162	0.089	0.008	0.158	0.06	Providing Service
			0.211	0.09	0.038	Safety
0.000	0.248	0.123	0.009	0.230	0.118	Hygiene
	0.557			0.578		R
	0.310			0.334		R <sup>2</sup>
	24.501			10.301		F
	0.144			0.158		Adj R <sup>2</sup>

It should be noted that the first step of multiple regression results show that two variables of readability and safety are not significant predictors of user satisfaction based on the results obtained from the single sample T-test in Tehran railway complex. Therefore, based on t-test results and the first stage of multiple regression test, in the second stage only four other variables were entered into the regression equation to test the effect of these variables on users' satisfaction without the intervention of two other variables of readability and safety. These findings show that all four remained variables at the probability error level of less than 0.05 represent a significant predictor of the labor-family conflict. At this stage also Physical Factors were identified as the strongest predictor of user satisfaction ( $Adj R^2 = 0.144$  and  $F_{4,161} = 24.501$ ,  $p < 0.001$ ). It should be noted that at this stage, regression analysis measures 0.28 of users' satisfaction variance that physical factors with the highest percentage (28.1%) are involved in this explanation.

## CONCLUSION

Today, the characteristics of architectural space determine the quality of human life while most attention of architects and urban planners is focused on areas and sites that have a high level of social activity. Among these sites, railway stations are of utmost importance due to creating the appropriate context for communication among different types of urban transport and attracting a huge number of audiences. In this paper, the effect of observing ergonomic indicators from the perspective

of environmental quality and their effects on users' satisfaction in Tehran railway station complex was studied. Human-oriented design, on one hand, deals with all human abilities, capacities and weaknesses and, on the other hand, with the environment and all its characteristics. The results indicate that, among the ergonomic, human-oriented and satisfaction with environmental quality indicators, two indicators of readability and safety are observed satisfying in the railway station complex while four other indicators include physical factors, vitality, service providing, and hygiene are faced with major problems. On the other hand, among four groups of passengers, employees, residents around the complex and service staff, if measures are taken to create or enhance indicators of physical factors, readability, vitality, service providing, safety, security and hygiene, satisfaction level of the first group will be more than other groups, after which the second group and the fourth group will be placed at last rank. Finally, after removing the two readability and safety indicators that are currently in the complex, the results of multiple regression indicate that the effect of the physical factors index is more than other factors and then, respectively, indicators of vitality, service providing, and hygiene have high priority in Tehran railway station complex. In general, it can be said that there is a direct relationship between environmental quality indicators and individuals' level of satisfaction. Therefore, it is very important that the environmental conditions are examined and then designed to achieve the desired quality with the help of ergonomic science components.



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