Original Research Article

Explanation of the Factors Affecting Users' Cognitive Maps in Passenger Terminals
(Case Study: Terminal of Imam Khomeini International Airport)*

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Abstract| Knowledge of the surroundings as a factor affecting the quality of the mental image plays an important role in navigation by users of airport terminals. However, disregarding the effects of the components on the quality of users' perception of such places' design has affected the relationship between users and these places. This study was conducted to answer the following questions: What is the effectiveness of components of the mental image and cognitive map on the optimum navigation by airport terminal users? What are the type and extent of the relationship between these components on the quality of navigation of the users of such places? Explanation of the factors affecting the formation and strengthening of the mental image with a focus on increasing the user quality was the main objective of this study, and making it easier to route public spaces was another objective. To achieve the research objectives, a quantitative strategy was used, relying on library and field studies. Qualitative data were collected based on the study of written references on the perception of the environment, mental images, and cognitive maps, and quantitative data were obtained from a field survey using a questionnaire in the study area. The study results showed that for the ranking, the frame (body), legibility (readability), search for meaning, and attractiveness have been the most effective on the cognitive map, respectively.

Keywords| *Mental image, Cognitive map, Navigation, Airport terminal, Imam Khomeini International Airport.*

Introduction and problem statement | Always there is a strong dialectical relationship between humans and their environment. For this reason, he is always affected by the environment and has a mutual effect on it. Meanwhile, behavioral patterns are greatly affected by environmental characteristics (Heidari & Farhady, 2018). Environmental characteristics together with

people's motivation and their perceived mental images of the environment form human behavior (Golestani, Roshan & Sheibani, 2015, 241). The mental image is the basis of any action and reaction between people and the environment, which may not completely overlap with the existing reality, but people behave based on this mental image and not the existing reality. A person's mental image of the environment affects his spatial behavior to some extent (Balali Oskoyi, Gharehbalou & Heydariturkmani, 2019, 214). The important function of cognitive maps is to induce and clarify environmental meanings (Ghoraba & Tabibian, 2017, 35). For example, the perception of distances of places is affected by factors such as road geometry. A path that is curved or has many

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intersections seems longer than a path with the same length but is straight. This difference in perception partially explains why people are willing to travel longer distances at airports and regional shopping center stops and in distant places (Pocock & Hudson, 1978). Airport terminals, due to the increase in population, the need for transportation, and the expansion of urban connections, are considered important parts of the transportation system, which, despite their importance and position, have been less addressed. In collective spaces, to respond and direct people better and faster to the given destination, considering the importance of time in such places, it seems necessary to understand the general principles of a mental image. A mental image as a result of the information in the place can be interpreted and analyzed, therefore, by analyzing and explaining the constituent elements of a mental image, it can be used as a criterion to optimize the design. By understanding the factors and components of a cognitive map, it is possible to help create a clearer image of the place in the minds of users. The clearer the image formed in the person's mind of the place; the person can move towards their given destination in less time with more satisfaction.

According to the introduction, the objective of this study was to identify and explain the factors and components affecting the formation of the cognitive map of people in the airport terminal to improve the quality of such spaces. The users of the statistical population are in the age group of more than 18 years.

According to what has been mentioned above, the present study seeks to answer the following questions:

- What are the effects of the cognitive image factors of users in the Terminal of Imam Khomeini International Airport?

- What is the importance of ranking the effects of mental image factors for users' navigation in the Terminal of Imam Khomeini International Airport?

- What is the importance of ranking the effects of components of mental image factors for users' navigation in the Terminal of Imam Khomeini International Airport?

To answer the main question of the research, according to the literature review and the opinions of the experts, various factors affecting the creation of the mental image were investigated, and then by developing and distributing the questionnaire, the relationship between the factors and components was measured and ranked according to the questions raised using SPSS.

Research Background

Among national studies conducted on an image and its constituent factors, the following studies can be mentioned:

In an article entitled "Principles of Effective Organization on the Creation of Mental Images of Prince Mahan International Garden Visitors", the authors identified and compared the factors that make up people's mental images of *the garden* by developing the mental images of the statistical population from a case sample. Then, analyzing the data by the Delphi technique determined the principles of effective organization of space to keep the mental image in people's memory. These principles include general geometry, movement path, hierarchy, spatial placement, full and empty space, context, and door and window details (Sheikh Asadi, Kazemzadeh & Hashem Nejad, 2017). Asadpour et al., in an article entitled "Mental Image of Children from the Perspective of Urban Streets" to identify the physical and non-physical factors affecting the mental image of 5-7-year-old children, by drawing and factor analysis, identified six factors forming the mental image of children, "nature and play", "street regulations", "sky nature", "street structure", "city landscape" and "intersection structure" (Asadpour, Barzegar & Keshavarzi, 2017). In an article entitled "Development of a Practical Model to Explain the Mental Structure of People's Cognitive Maps through Morphological-Spatial Analysis of Existing Urban Contexts", the authors, in order to find which elements and objective analysis have a greater effect in explaining the structures in cognitive maps, by analyzing people's cognitive maps found that in the physical dimension, the mental structure is mostly explained by "axial depth", in the functional dimension "mean depth of the convex space" and in the semantic dimension "convex space connectivity" (Ghoraba & Tabibian, 2017). In an article entitled "Analysis of the Spatial Quality of *Prince Mahan* International *Garden* based on the Theory of Movement and Evaluation of the Audience's Mental Image", the problem of the research is to survey the effect of the structure of *Prince Mahan* International *Garden* with spatial organization of different spatial sequences on the audience's perception due to movement in the garden space. By identifying the spatial sequences of the garden, the movement factors were evaluated including axis, hierarchy, rhythm, level difference, and transparency. The results obtained from the analysis indicated that different sequences in this garden brought common mental images to the audience; indicating the significant effects of these components. In this study, movement components based on the mental image include displacement, eye movement, and feeling (geometry, hierarchy, rhythm, transparency,

axis, and level difference). Finally, it was concluded that *Prince Mahan* International *Garden*, by creating a common mental image in different audiences, is a successful example of creating all kinds of physical, visual, and semantic movement (Azmoon & Moeini, 2018). An article entitled "Presenting a Conceptual Model of Legibility based on the Mental Image", by raising the question, what are the components of the observer's mental image of the physical place? authors sought a better understanding of the concept of legibility and presented a conceptual model of the relationship between the components. The study results showed that, in addition to the spatial components, the observer's mental image includes human and time components, which can be called a spatial mental image, including identity and structure, temporal mental image, including individual and collective experience and social events, emotional mental image including the sense of belonging to place and community as well as physical, historical and emotional evaluations (Nazif & Motalebi, 2019). Given the importance of the physical characteristics of schools, in an article entitled "Analysis of Physical Factors Affecting Children's Mental Map of Educational Places", the physical components affecting children's mental image of educational places were investigated by sketch maps and analysis using software in the elementary schools of Rasht city. In this study, the "space geometry and layout", "open and semi-open spaces", "communication spaces" and signs were identified as the factors that make up children's mental images, and the "space geometry and layout" had the greatest effect on children's mental maps (Hoseledar Saber, Safari, Asadi & Akbari Gavabari, 2021).

The definitions proposed by the experts in relation to mental imagery are presented in Table 1.

Several studies have been conducted on the factors and components in the field of mental images and cognitive maps:

For the first time in urban studies, Kevin Lynch, 1960 explained the topic of the image in his book "The Image of the City (1960)". Accordingly, the image is obtained from three components: identity, structure, and meaning. Identity is the distinctive character of the object, structure refers to the spatial relationships with other objects, and meaning is the emotional and functional characterization of the object. Although Lynch raised these cases, he only emphasized the physical components of the urban environment and neglected the meaning. His goal was to achieve a quality called legibility and imageability, which means

a quality in the object that creates a clear image in the observer's mind. In order to achieve goals such as legibility and visibility as the objectives of knowing the city and creating a mental image, he used the five components of edge, district, node, landmark, and path as organizers of people's mental images. These five components proposed by Lynch were later redefined by other theorists such as Schulz, Stea, and Appleyard (Sohrabian, Habib, 2016) (Norberg-Schulz, 1971).

David Stea (Long, 2007) defined another set of components in a cognitive map: points, breaks, boundaries, and paths. Paths were similar to Lynch's. The breaks were like edges and points were like nodes. In the same way, Appleyard defined cities using sequential or spatial elements perceived and structured. Lynch's paths and nodes are considered sequential elements, and landmarks, districts, and edges are almost spatial elements (Lynch, 1960).

Gartner considered the image to have three cognitive, emotional, and behavioral components. Cognitive components include features with which a person identifies or understands the characteristics of an urban space, and emotional components express a person's attitude and feelings towards the urban space, which are developed through past experiences related to that place, residents, goals, and organizations related (Gartner, 1996; Luque-Martinez, Del Barrio-García, Ibanez-Zapata, & Molina, 2007).

Appleyard (1970) considered form, visibility, and use as the factors affecting the mental image. Eraydın (2007) stated the legibility and mental image based on complexity, diversity, continuity, hierarchy, and integration. According to *Mondschein*, components of the cognitive map are points, lines, and areas, for which other theories such as Lynch (path, landmark, edge, node, and district), Norberg-Schulz (place, path, and territory), and … (points, boundaries, paths, and breaks), had different definitions of the three components of the cognitive map (Pakzad & Bozorg, 2014). Negro (2003) introduced the landmark as the most important component of cognitive maps and believed that contrast, color, and imageability are also effective. Kitchin (1994) defined a cognitive map as the process of encoding, collecting, and modifying tangible and experienced information and introduced the path, landmark, node, district, and edge as components affecting the cognitive map. Neisser (1976) stated that a cognitive map is an oriented schema, an active and cognitive structure. In fact, the mental scheme is within the perceiving person and its quality is determined by experience.

Table 1. Factors affecting the mental image according to the national experts. Source: Authors.

Factors affecting the mental image	Suthor	Year	Title
General geometry, movement path, hierarchy and spatial placement, full and empty space, texture, and door and window details	Sheikh Asadi et al.	2017	Principles of the organization effective in creating mental images of Prince Mahan International Garden visitors
Nature and play, street regulations, nature and sky, street structure, city landscape, and intersection structure	Asadpour et al.	2017	Children's imagery from the perspective of city streets
The frame (the strongest explanation: axial depth, the network of context passages), Function (the strongest explanation: the mean depth of the convex space) and Meaning (the strongest explanation: convex space connectivity, convex spatial intensity, total depth of convex space, control of convex space, and network of context passages)	Ghoraba & Tabibian	2017	Developing a practical model for explaining the mental structure of people's cognitive maps through Spatial morphological analyzes of existing urban tissues Case Study: historical context of Kerman city
Movement components based on mental image: displacement, eye movement, and feeling (geometry, hierarchy, rhythm, transparency, axis, and level difference)	Azmoon & Moeini	2018	Spatial quality analysis of Prince Mahan International Garden based on the movement theory and evaluating the mental image of the audience
Spatial (function, frame, scale), temporal (physiological, psychological, collective behavior, individual behavior, belonging to the community, belonging to the place), and human (historical history, individual experience, and social event) components	Nazif & Motalebi	2019	Presenting a conceptual model of legibility based on mental imagination
Geometry and layout of space, open and semi-open spaces, communication spaces, and signs	Hoseledar Saber et al.	2021	Investigating and analyzing the physical factors affecting children's cognitive map of educational environments (case study: the second grade of elementary schools in Rasht)

Table 2. Factors affecting image formation according to the experts. Source: Authors.

Factors affecting the mental image	Theorist
Path, landmark, edge, node, and district	Lynch
Place, path, and territory	Norberg-Schulz
Form, visibility, and use	Appleyard
Points, breaks, boundaries, and paths	…
Continuity, dissimilarity, form, Proximity, and similarity	Gestalt philosophy
Structure, identity, affection (Nturalness, order, history, flirting, and keeping)	Neisser
Rapidly unfolding and inferential (Predictable)	Kaplan
Components of the child's mental Image of the surroundings include Plant and animal species, houses, sun, clouds, and humans.	Günindi
Points, lines, and areas	Mondschein
Path, landmark, node, district, and edge	Kitchin

According to the studies conducted, the definitions proposed and the opinions of experts, several factors are involved in the image in people's minds, the most significant and frequent of which are given in Table 2.

Theoretical Principles
• Mental image and cognitive map

Mental images (cognitive maps) have been interpreted as brief data that individuals, groups, organizations, and societies create and use in their minds to observe, understand and represent the perceived phenomenon in the real world (Zeile, Resch, Exner & Sagl, 2015). In order to understand the meaning of the mental image, one should first know that everything a person sees is only in his mind, and what is formed in his mind from the outside world, becomes objective only with his help. In fact, the mind is dependent on a single human being and when it comes out, it becomes objective (Falamaki, 2002). Observing means creating a mental image based on past experiences and observations. The more information storage in the mind is not well organized, the more difficult and incomplete it will be to use that information to recognize and create a correct and complete image. It is obvious that mental imaginations may not exist externally at all, and may only be examples

of some properties of the real world. This mental image may only consist of a few irregularly placed nouns. But as soon as we find an image, however incomplete, we can make a model, however incomplete, that shows us what points or elements people's attention is focused on and what is their mental image (Bahraini, 2003). This mental image, in addition to the spatial components that are the result of the environmental image formed in the observer's mind, includes cognitive components based on the beliefs, values, and opinions of the individual and emotional components arising from the positive and negative feelings of the individual towards a phenomenon, as well as behavioral components. (Tayyebi & Zekavat, 2017). Simply, the term cognitive map (mental image) means creating a map or an image in the mind (Roberts, 2003). In fact, people behave based on mental image and not reality (Pakzad & Bozorg, 2012). Cognition is affected by mental, personality, and cultural factors, cognitive abilities on one hand and social and physical experience on the other hand, which caused it to be very important in the mental images.

An important point is a difference between the cognitive map or image and the mental image. A cognitive map is the result of a set of psychological processes through which a person encodes, stores, and retrieves the knowledge obtained from the elements, positions, distance, direction, and the general pattern of the surroundings (Vaez, Burke & Alizadeh, 2016). These images are incomplete, fragmented, and mentally distorted representations of the surroundings. They are continuously updated and therefore provide a snapshot of one's existing frame knowledge (Kara, 2013). In some scientific writings, the "mental map" has also been interpreted as a "cognitive map" (Downs & Stea, 1973; Fenster, 2009; Roberts, 2003).

• **Process of communicating with the surroundings and imaging**

Mental images and cognitive maps are considered tools to achieve the internal representation of a place. To understand the mechanism of our knowledge of the surroundings, the main way to achieve this goal is to draw a cognitive map, that is, to create a mental image of the surroundings that people form and use as a model of behavior (Asadpour, Faizi, Mozaaffar & Behzadfar, 2015). According to Gestalt philosophy, the human mind consists of meaningful general perceptions that are connected to each other through association and thus interpret phenomena (Naghizadeh, 2007). The images that arise from the surroundings in the observer's mind are the result of a two-way flow between the observer and the surroundings. The observer selects and organizes some visual factors in his mind. The image of any

assumed fixed factor may be completely different in the minds of different observers. The image components may be interconnected in different ways. There are few significant organized factors in the observed object. However, because the observer has been familiar with it for a long time, it has become clear and organized in his mind. An individual may find his desired object easily in a place where all the objects in it seem confused. In contrast, the object may be observed for the first time and easily create a clear image in the mind, not because it is familiar to the observer, but because of its similarity and harmony with the image that is already present in the observer's mind. Lynch considered the contribution of the observer to be effective in developing mental images of the surroundings as an innovative individual who changes his mental images with changing needs (Lynch, 1960). People are not neutral and indifferent in relation to their surroundings and remember the places to which they have a stronger feeling. In fact, people feel their surroundings based on evaluations that arise from feelings, conclusions, inferences, and behaviors. Emphasizing the role of human characteristics and the observer's mental background, Nasar (2014) considered mental images as the result of the observer's analysis of the surroundings, which may include a feeling that is directly related to the structure of the form, which requires mental perception and activity and can be derived from the content meaning of the form.

• **Navigation**

Humans use mental solutions and discoveries to perform navigation stages (Hölscher, Meilinger, Vrachliotis, Brösamle, & Knauff, 2004, 44). The experience of receiving mental images occurs during movement. Navigation is a daily matter in people's life. It is so obvious that sometimes the necessary infrastructure for proper and principled guidance of people is neglected. Anything that facilitates the formation of cognitive maps of the path also facilitates navigation (Lawton & Kallai, 2002). Movement is the basis of all spatial experiences, and the perception of space relies on movement. To the best of our knowledge, in the world of creation, everything is dynamic and evolving, with an internal movement (Rahimian, 2004). Kitchin stated that when a map of an environment is formed in an individual's mind, he easily perceives the form of the environment and knows where it is in every minute (Kitchin, 1994). In fact, people form their cognitive map by moving in space, which relies on environmental and individual factors (Long, 2007). Understanding the navigation process helps determine the best way to improve its performance. The model presented by … and … (1997) (Fig. 1) is a complete model that integrates movement into the navigation
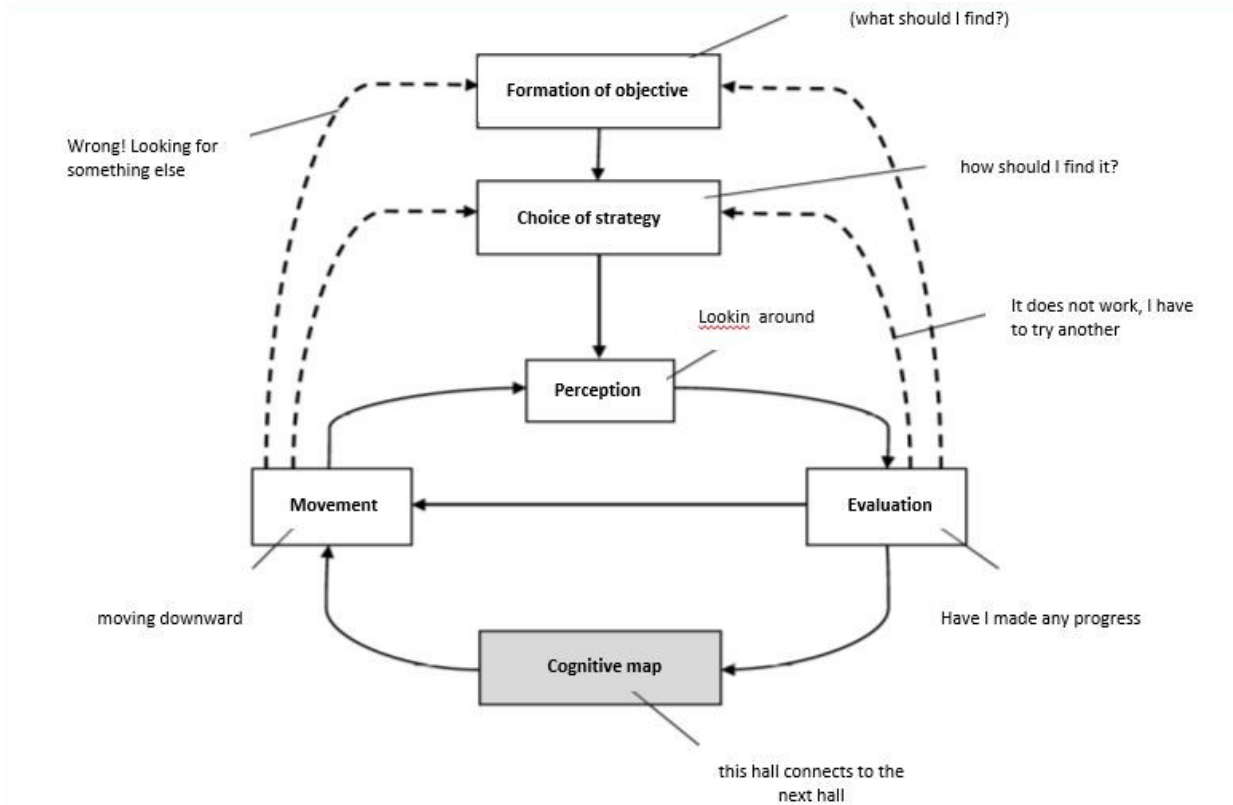
Fig. 1. Navigation stages . Source: Schlender, Peters & Wienhöfer, 2000.

process and in a direction that the individual has not previously experienced (Chen & Stanney, 2000, 676; Downs & Stea, 1977; Neisser, 1976; Spence, 1999, 918).

Identification and Classification of Research Variables

The mental images formed in people's minds include many factors and components. According to the analysis of the factors raised in numerous studies, they can be generally classified into four categories: frame, legibility, search for meaning, and attractiveness. The selection process of the components is based on semantic affinity by a cumulative approach. Meanwhile, the variables mentioned in less than two scientific documents have been excluded from the selection process. Based on the classification, the general geometry, hierarchy, rhythm-repetition, airspace, function, and height difference are related to the body; transparency, non-verbal cues, symbolic importance, language/words, unwanted information control, and flooring are related to the legibility; non-verbal cues, time, identity, belonging, semantic-sacred and the five senses are related to the search for meaning, and finally, the scale, intuition, complementary functions, light, the use of natural elements and technology are related to

the attractiveness. Also, the factors are the independent variables and the components and sub-branches related to each category are the dependent variables (Table 3).

Note: The non-verbal cues are related to the legibility and search for meaning. This variable in legibility refers to the details in the architectural elements that make the environment legible, and in the search for meaning includes components that induce the user implications.

Study Area

The study area in this article is the Terminal of Imam Khomeini International Airport, Tehran. This airport is located 35 km south of the capital of our country. The main space of the passenger terminal consists of four floors with an area of about 80,000 m², including the surroundings, including the central engine room and four-floor parking. This terminal consists of two parts, the air side, and the ground side.

Method

The present study, which was conducted to explain the components affecting the mental image with a focus on collective use, is applied in terms of the objective, descriptive in terms of research method, and a library and field study in terms of the data collection method.

Table 3. Classification of factors affecting the formation of the mental image consistent with optimal navigation in collective spaces. Source: Authors.

Independent variables			Factors affecting the formation of the mental image of users
Classification			Index
Frame			General geometry
			hierarchy
			rhythm-repetition
			airspace
			function
legibility			height difference
			transparency
			non-verbal cues
			symbolic importance
			language/words
		dependent variables	control of unwanted information
			flooring
search for meaning			non-verbal cues
			time
			identity
			belonging
			semantic-sacred (spiritual)
			five senses
			scale
attractiveness			intuition
			complementary functions
			light
			use of natural elements
			use of technology

The statistical population included the users of the terminal in the age group of more than 18 years, which according to the population announced in 1401, the population of passengers is estimated to be about 7,821,369 people. The statistical sample 383. 98 was obtained from the Cochran formula, and in order to avoid sample drop, 385 passengers were selected by a simple random method at a confidence level of 0.95. In the present study, data were collected by two library methods and questionnaire distribution. In the library method, national and international articles and books related to the research literature were used to enrich the literature and generalities of the research. The tool for identifying the indicators of mental image in collective spaces in the present study is a researcher-made questionnaire with 24 items. The method of scoring the test is based on the five-point Likert scale (very little=1, little=2, somewhat=3, high=4, and very high=5). This questionnaire has 4 dimensions: frame, legibility, search for meaning, and attractiveness. SPSS version 25 was used for data analysis. For data analysis and hypotheses tests, the Kolmogorov-Smirnov, Friedman, and binomial tests have been used. Due to the simultaneity of conducting this study and the restrictions caused by the Covid-19 pandemic, the questionnaires were distributed at several different intervals.

Discussion and Results

Before analyzing the results, it is necessary to confirm the validity and reliability of the research tool. Given that the components of the questionnaire were developed in the process of literature review and the selection mechanism of variables, content validity has been confirmed. The designed questionnaire was provided to experts in the

Table 4. Cronbach's alpha for the reliability of the research tool. Source: Authors.

Variable	Cronbach's alpha
Questions on body	0.89
Questions on legibility	0.85
Questions on the search for meaning	0.76
Questions on attractiveness	0.83
Questionnaire questions	0.87

research field for a survey, and in a corrective process, formal validity was also confirmed. For the reliability of the research tool, according to the time limit of the research, Cronbach's alpha was used. As shown in Table 4, Cronbach's alpha is higher than 0.70, indicating that the items of the research tool (questionnaire) have a high internal correlation and that the reliability of the questionnaire is acceptable.

The results of the normality of data distribution, descriptive analysis of variables, the type and relationship between components, and ranking of the research indicators were investigated using the Kolmogorov-Smirnov, Friedman, and binomial tests as follows.

The study results of the normality or non-normality of the data distribution using the Kolmogorov-Smirnov test found that the significance level of all variables is less than 0. 05 (Table 5). Therefore, it can be concluded that none of the variables of the research were normal, so the non-normality of the variables justifies the use of non-parametric tests for the research hypotheses.

H1: The mental image factors (frame, legibility, search for meaning, and attractiveness) are effective in the optimum navigation of users in the Terminal of Imam Khomeini International Airport.

In order to identify the effects of mental image components and navigation in the terminal according to the users' opinions, the binomial test was used in the Terminal of Imam Khomeini International Airport, and the results are presented in Table 6.

According to Table 6, the significance level is 0.000 and less than 0.05. For the frame, according to the users' opinions, 84% of the answers show more than the mean effect; for the legibility, 79% of the answers show more than the mean effect; for the search for meaning, 66% of answers show more than mean effect; and for the attractiveness, 73% of the answers show more than mean effect, indicating the effects of mental image components (frame, legibility, search

for meaning, and attractiveness) on the optimum navigation of users in the Terminal of Imam Khomeini International Airport.

H2: The mental image factors (frame, legibility, search for meaning, and attractiveness) can be prioritized for the navigation of users in the Terminal of Imam Khomeini International Airport.

As shown in Table 7, because the significance level of 0.000 is smaller than the error, the assumption of the equal mean rank of the components of frame, legibility, search for meaning, and attractiveness is rejected. Therefore, at the 95% confidence level, it can be stated that the effectiveness of the mental image components on the optimum navigation of users in the Terminal of Imam Khomeini International Airport is not equal. In other words, some variables are more important than others variables. Table 8 shows the mean rank and prioritization of mental image components (frame, legibility, search for meaning, and attractiveness) for the optimum navigation of users in the Terminal of Imam Khomeini International Airport.

H3: The effects of the components of factors (frame, legibility, search for meaning, and attractiveness) of the cognitive image for the navigation of users in the Terminal of Imam Khomeini International Airport can be ranked in terms of importance.

To test this hypothesis, using the Friedman test, the research variables were ranked from the point of view of the population (Table 9). In other words, this hypothesis test has determined which of the criteria of the mental image is more important than other indicators for the navigation of users. According to users, the importance of the criteria in each of the four components of frame, legibility, search for meaning, and attractiveness is also different.

Conclusion

Creating a clear mental image can be the basis of

Table 5. Test of the assumption of normality of distribution of variables. Source: Authors.

Variable	Z	Significance level
Body	1.597	0.000
Legibility	2.882	0.000
Search for meaning	2.318	0.000
Attractiveness	2.664	0.000

Table 6. Results of the binomial test to identify the effects of the mental image components and navigation in the terminal according to the users' opinions. Source: Authors.

Factor	Group	No.	Ratio	test	Significance level
Frame	Less than or equal to the mean	62	0.16		
	More than the mean	323	0.84	0.5	0.000
Legibility	Less than or equal to the mean	79	0.21		
	More than the mean	306	0.79	0.5	0.000
Search for meaning	Less than or equal to the mean	131	0.34		
	More than the mean	254	0.66	0.5	0.000
Attractiveness	Less than or equal to the mean	105	0.27		
	More than the mean	280	0.73	0.5	0.000

Table 7. Results of Friedman's test of the mental image factors. Source: Authors.

No.	385
Statistic	18.492
Degree of freedom	3
Significance level	0.000

Table 8. Mean rank and prioritization of mental image factors (frame, legibility, search for meaning, and attractiveness). Source: Authors.

No.	Mental image factors	Mean rank	Priority
1	Body	2.66	1
2	Legibility	2.58	3
3	Search for meaning	2.45	2
4	Attractiveness	2.31	4

optimum navigation. In this regard, identifying the organizing principles of the cognitive map plays an important role in helping designers and architects to optimize the design process. Understanding the importance of this issue will help the designer to create space and in the design process, consciously select factors that will

Table 9. Results of the Friedman test. Source: Authors.

Factor	Component	Mean rank	Priority
Frame	General geometry	3.46	5
	Hierarchy	3.77	2
	Rhythm-repetition	3.58	4
	Airspace	3.61	3
	Function	2.78	6
	Height difference	3.79	1
Legibility	Transparency	2.51	6
	Non-verbal cues	3.16	5
	Symbolic importance	3.37	4
	Language/words	3.67	3
	Control of unwanted information	4.52	1
	Flooring	3.77	2
search for meaning	Non-verbal cues	2.78	6
	Time	3.37	4
	Identity	3.99	1
	Belonging	3.88	2
	Semantic-sacred (spiritual)	3.23	5
	Five senses	3.75	3
attractiveness	Scale	2.95	6
	Intuition	3.64	3
	Complementary functions	2.97	5
	Light	3.63	4
	Use of natural elements	3.72	2
	Use of technology	4.09	1

make the space more readable to the users. In the present study, the factors and components affecting the mental image were identified based on the opinions of experts in this field, and then the effects of these factors and components were ranked according to the opinions of the users of the Terminal of Imam Khomeini International Airport. Analysis done for answering the first question of the research on the effects of the components using the binomial test shows that from the users' point of view, all the factors are effective in creating a cognitive map. The factors were ranked according to priority: frame, legibility, search for meaning, and attractiveness.

To answer the third research question on ranking the effectiveness of each of the factors' components (frame, legibility, search for meaning, and attractiveness) in terms of the effect on navigation in the terminal, the priority and importance are as follows:

1. Attention to the height difference, hierarchy, airspace, rhythm-repetition, general geometry, and performance

2. Control of unwanted information, framing, language/words, symbolic significance, non-verbal cues, and transparency

3. Identity, belonging, five senses, time, semantic-spiritual, and non-verbal cues

4. Use of technology, use of natural elements, discovery and intuition, light and illumination, complementary functions and scale

According to the recognition of mental image factors and components, considering the lack of information in this field and airport terminals, the need to address and increase knowledge seems necessary, which finally will provide the optimum design and easier navigation. It is hoped that this article will be used by future researchers and lead to similar studies in different cases.

Acknowledgments

Conflict of Interests

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication, falsification, double publication, submission, and redundancy, have been completely witnessed by the authors.

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