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Original Research Article

Explaining the Relation Between the Spatial and Symbolic System in the Eventuality of Large-Scale Spaces (Case Study: Sabzeh Meydan and Mesgarha Bazaar in Tehran's Grand Bazaar)*

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Abstract

Problem statement: In the tradition of interdisciplinary studies of architecture and human sciences since the 80s, the relationship and interaction between man and space have been studied mostly through the lens of behavioral sciences. This study draws upon cognitive science to examine human-space interaction from cognitive aspects, mind, and memory in spatial experience and show that the eventuality of space and other components depend on human episodic and cognitive memory.

Research objective: This study aims to determine the qualitative ratio of the role of episodic memory in the eventuality of large-scale spaces through the comparison of spatial systems and visual symbolic signs.

Research method: Using qualitative, descriptive, and pragmatic methods, this study attempts to link the eventuality in space to the recording of space in active memory through surveying and mapping of behavior. Field observations were made through direct observation and the data was interpreted to map spatial events in two rows of shops in Tehran's Grand Bazaar.

Conclusion: The results of this study show that two spatial and symbolic systems have different contributions and effects on the active memory and eventuality of space. The spatial system, endogenously, directly, immediately, and through spatial perception and experience expands the field for the eventuality and the symbolic system indirectly provides the recognition of spatial components by recording, rereading, and through mediation, with an effect on human episodic memory.

Keywords: *Spatial research, Cognitive sciences, Episodic memory, Mapping.*

Introduction

The tradition of interdisciplinary architectural research was formed in the 1960s, and the fields of humanities and human sciences were connected

with architecture, and it expanded in the 1970s and 1980s, with the use of anthropology, behavioral sciences, and psychology subcategories. John T. Lang's publications in the late 1980s (Lang, 1987)

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were the achievements of this intellectual discourse. The main and general feature of the interdisciplinary discourse of behavioral sciences and architecture was the emphasis on the mutual influence of human behavior and the environment, and it paid less attention to cognitive domains, mental life, and its sub-branches. This theoretical-practical gap in dealing with cognitive sciences and its effects on architecture and spatial studies highlights the context and necessity of such research to raise a post-behavioral science discourse in the scope and field of spatial research and spatial computation.

Philosophers, sociologists, artists, and architects have paid much attention to space in the last few decades. It seems that the category of space is a shared aspect of a big part of life and human experience in material, mental-abstract, and social dimensions and it is the common framework of coexistence of different theoretical-practical fields. Research about space or spatial research, from different perspectives from positivism to existential phenomenology, is a platform that examines the effective factors in creating space, its experience, and its criticism and reproduction from different dimensions and aspects. These studies deal with spatial configuration and how it is received (Derix & Izaki, 2014) by the creator, the audience, and the audience who becomes the reproducing creator of the space. In this perception of space, the event is defined as a hidden part, discoverable and extractable by the creator's audience, and the eventuality of the space, which is the ability to accept, generate and contain different events, becomes an inseparable feature of the space. In the meantime, referring to the content of cognitive science and its historical process can expand the field of the upcoming discussion.

Although the origin and source of cognitive science studies are rooted in the Greek era, it is recognized in the 19th century, which was the starting point of new and modern sciences, with the emergence of an independent branch of experimental psychology, and it expands in the middle of the 50s. This branch provides studies and research

for the study of the mind from a theoretical and methodological perspective. In these considerations, the mind means the sum of all manifestations of intelligence and awareness, which can be divided into thinking, perception, memory, reasoning, and cognitive processes. Cognitive science itself has an interdisciplinary nature, and it deals with the field of mental connection, intelligence, acceptance method and analysis, psychology, intelligence, machine learning, neuroscience, linguistics, and anthropology (Thagard, 2020). One of cognitive science's main goals is to accept the brain as an organ that is responsible for computing and managing representations and their processing (Calek, Hirschen, Mendick & Waskan, 2016, 9).

Invoking cognitive science and its sub-branches, including partial or episodic memory, to spatial research provides the context for the discovery, extraction, and renewal of the relationships between spatial design and the experience of architectural space from the perspective of the creator, the audience, and the creator audience for event design and eventuality. Since episodic memory includes narrative production, signs, and events dependent on time, place, and experience, it can connect mental spaces, material spaces, and social spaces. This episodic memory allows our mind to narrate the pattern, structure, and spatial system from its perspective, to record and remember them through the system of signs and symbols, and to recreate spatial events through experiences and memories (Fig. 1).

The problem of this research is formulated and designed in this way: How to do the spatial system and the symbolic system of the architectural work lead to the recording of the narrative and the creation of the event in the space?

To achieve clear, distinct, and obvious results, large-scale spaces, where episodic memory plays a more important role in recalling them, have been selected for testing the research. Spaces such as large historical and ancient markets, large commercial centers, large passenger terminals, and large

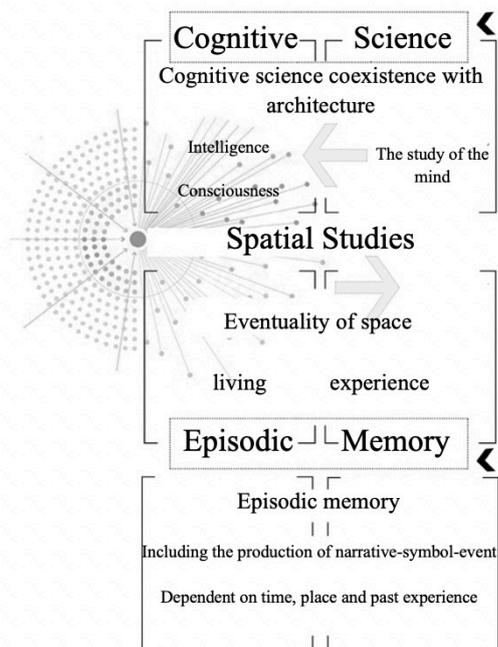


Fig. 1. Formulation of the concepts of cognitive science, spatial research, and episodic memory in architecture. Source: Authors.

museums are of this category; in this research, two rows of Tehran’s Grand Bazaar have been selected to study, survey, map, and interpret their spatial structure and their symbolic structure.

In the following, the research background, literature and theoretical framework, research method, discussion, and finally the conclusion will be discussed.

Research Background

In their article, (Nuxoll & Laird, 2004) effective factors in storing, encoding, and retrieving information from space in the human mind and event system, and in another article (Nuxoll & Laird, 2007) they proposed the relationship of the episodic memory system in the reaction and connection with the signs, and they examine the role of the episodic memory in organizing the Spatial complexities and difficulty in crowded places.

In their article, (Langley, Laird & Rogers, 2006) studied the infrastructure of cognitive architecture and they examined the ability to find solutions, plan, evaluate, understand the situation, remember, reflect, and learn in the space of architecture.

In their article, (Duch, Ontario & Pasquier, 2008)

explored specific patterns of problem-solving in architecture and examined their relationship with different types of memory and semantic interpretation and representation of information patterns (Sussman & Holland, 2015). in the book “Cognitive Architecture”, explained the principles of narration, thigmotaxis, and facial and spatial patterns in recording events, spatial experience, and lived space. They also discussed the process of memorization in the mind.

In their article, (Marjuei, Shahedi, Piravi Vanak & Ghasemi Sichani, 2018) discussed the differences between behavioral sciences and cognitive sciences in architecture (Mitsopoulos & Thomson, 2020). discussed the relationship between cognitive needs with predicting human function and performance in space.

A close look at the background of the research shows that the relationship between human episodic memory and the eventuality of the space has not been the main variable of the previous studies, and also the spatial system and the symbolic system have not been mentioned as variables that continuously monitor the architectural space.

In Table 1 the sources used are presented according to the subject area, the name of the work, the year of publication, the author, and the focus of the subject:

Literature and Theoretical Framework

In this section, by addressing the concepts, theories, and models of the topic, the theoretical framework of the discussion will be formulated and will be the basis of the research method. The format of this section is the four entries of spatial system, symbolic system, episodic memory, and eventuality.

• Spatial System

Space, in a broad concept that includes mental, material, and social life, is the platform for human interaction with himself, with other humans, groups, society, and in a larger view, with the whole existence. The category of space has very wide dimensions and in this study, it is mostly addressed with post-structuralist devices. The space, in the

Table 1. The tree of knowledge from the background of research. Source: Authors.

Field	Title	Year	Author(s)	Focus of discussion
Cognitive Science and Partial memory	Philosophy of cognitive science	2017	Cain	Philosophy of cognition and the cognitive process of the brain
	A philosophical introduction to cognitive science	2017	Harre	Types of cognitive models in the Brain
	Cognitive science: An introduction to the mind and brain	2017	Calek, et al.	The roots of cognitive science
	Cognitive science to strengthen deep introspection	2020	Mitsopoulos & Thomson	Behavioral model through attention and memory
	Cognitive science: the way forward	2008	Duch, Oentaryo & Pasquier	Patterns of memory and memorization
	Expanding cognitive science through episodic memory	2007	Nuxoll & Laird	Memorization, encryption, and memory recalling
	Cognitive models of episodic memory	2004	Nuxoll & Laird	Description of signs based on the role of episodic memory
Cognitive architecture	Cognitive architecture	2015	Sussman & Holland	The principles of narration, patterns, thigmotaxis, and perceptions
	Architecture as a simple mind	2018	Marjuei, et al.	The difference between behavioral science and cognitive science + Architecture as a part of the mind
	Cognitive architecture: research issues and challenges	2006	Langley, et al.	Capabilities of cognitive architecture

mental-mathematical dimension, implies the global connection of the points and borders, and boundaries of the set of components, and the components of this space are active and can contract and expand. It connects the relationships and structure of points and distinguishes them from other collections (Dalarsson, 2015); In architecture, material space implies continuity, limits, and boundaries based on time and location gap, and nowadays it is accepted that it is connected with mental-abstract space and social space. Today, the study of the material space of architecture appears limited and incomplete without considering the mental space of the creator, the audience, and their social space. For this reason, understanding the space system, which refers to the structure and organized components of space, is essential for the study of space. Mental structures are understood and perceived by facing the external reality and comparing it with prior recognized forms (Unger, 2011, 3). This understanding is an aspect of conscious living experience and the lived space becomes a lived experience (Buchanan & Lambert, 2005). This understanding and experience form spatial thinking that is connected with action and

human activism and is the creator of the spatial construct (Schwarzer, 1999). Today’s space, which is based on experience and living, expands social relations by setting boundaries and avoiding boundaries through physical experience (Forty, 2000); The spatial system is a mediator of real and practical experience, and it is an act of being (Dovey, 2010). Fig 2 shows how variables and concepts are related.

• **Symbolic system**

In a broad spectrum, a sign means the nature, the quality, or the event that indicates the occurrence and presence of something else. Different categories, such as Saussure’s and Peirce’s have been presented in the explanation of signs. Peirce’s classification includes iconic, indexical, and symbolic. In this article, wherever “sign” is used, it means a symbolic sign that often has a conventional language and interpretation. In the 1960s, the hypothesis of the symbolic [signs] system was proposed, which focused on models of cognition. In this system, a symbolic sign and its structure are material and conventional (Harre, 2017, 233). The continuity of words, faces and body postures, designs and pictures,

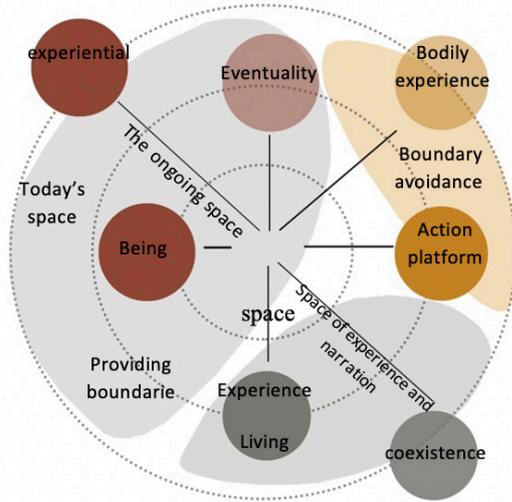


Fig .2 .Concepts including the spatial system .Source :Authors.

symbols and models creates a connected network of signs and forms a symbolic structure, which can be readable by the audience. This sign system is used to identify, distinguish and recognize different subjects and spatial pieces (Wang, Liang, Duarte & Zhang, 2019), and the difficult, unknown, and ambiguous spaces can be identified with the help of symbolic signs and symbols (Unger, 2011) and the possibility of orientation and navigation is provided (Werner & Schindler, 2004). These symbolic sign systems create an effective layer for perception and response to the space and the surrounding environment.

• **Episodic memory**

An important part of cognitive science deals with the functioning of the mind and links it to other fields of knowledge (Tulving, 1983). Episodic memory is one of the important elements of the mind and mental life. Episodic memory means all those things that a person remembers, and includes background information about certain events in connection with the environment, and it expands based on the semantic-narrative structure. The process of recording in episodic memory is through the experience of events and spatial and free human action (Duval, 2016, 17-22). The episodic memory is responsible for shaping the cognitive capacity of space by explaining experiential ability, eventuality, and living in the space (Oberauer, Wilhelm, Wittman

& Martin, 2002); (Perner, Kloo & Gomik, 2007), as it reconstructs the experiences of different parts, and replaces new programs and experiences (Clayton, Salwiczek & Dickinson, 2007).

In general, the factors affecting the recording of the events resulting from the lived space in the mind and its memorization in the memory can be summarized in three principles of narration, thigmotaxis, and patterns. (1) The principle of narration depends on the linguistic tendency of the mind and its desire to express itself and present this expression and narration to another. Storytelling is one of its key pieces of evidence. Narratives are expressed in different ways by using historical events, spatial features, and characters, and they imply variations of people’s lived experience; (2) the principle of thigmotaxis is subject to the boundaries that physically, mentally, or socially limit the human surroundings and give a sense of inclusion. The effort to contract or expand these boundaries and the pull in different directions are formed in humans to explore space and movement or stillness; And (3) the principle of patterns implies the feature of recognizing faces and shapes, which usually works for most people in the range of fewer than seven meters, and allows humans to recognize entities and positions (Sussman & Holland, 2015, 20). Fig. 3 describes the relationship between variables and concepts in episodic memory.

• **Eventuality**

In the last few decades ,the term *event* has received attention in various fields of human knowledge such as philosophy, sociology, linguistics, cognitive sciences, art, and architecture. In a general view, events are descriptions of things that often happen and occur (Oxford Dictionaries, N.D.). It seems that in a closer look, events have clear time boundaries but relatively vague spatial boundaries, in such a way that by having distinct parts, they can make the individual and the audience commit to and depend on the event from various perceptual aspects, activism, language and thought (Casati & Varzi, 2020). This action, activism, and actionability as a subset of the event, is a conceptual and intellectual

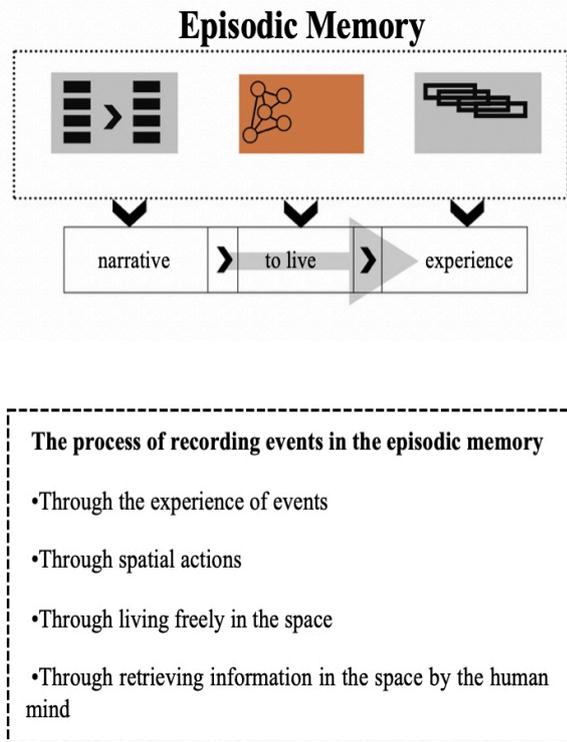


Fig. 3. The manner of the episodic memory's functioning .Source :Authors.

device for the relationships between factors and the event. In the space of architecture, the event has a creator and an audience, other than the temporal and spatial dimensions observing the activities and mental experiences, and it is included the experiences of human factors .

Focusing on the concept of an *event* and its application in the field of architecture is rooted in the writings and experiences of Bernard Tschumi in the 1970s and 1980s. He seeks to change the concept of functional space to event space so that it accepts the will of the creator audience (Tschumi, 1994, 255); A space that is a platform for future events and is waiting for another event (Beigel & Christou, 1996, 18). Koolhaas, by a programmed layering on space, also encourages the dynamic coexistence and eventuality of spaces through the interaction of activities and architecture (Koolhaas, 2004, 73). It can be said that the lived experience through the event and the eventuality of space are among the field of human-social affairs that includes fertility. Fig. 4 describes the concepts and variables of eventuality from theoretical aspects.

• **The Theoretical Framework of the Research**

In this research ,episodic memory is the independent variable ,eventuality is the dependent variable ,and spatial system and symbolic system are intervening variables .The spatial system is characterized by the micro-variables of integration ,continuity ,and activity ,and the symbolic sign system is expressed by the micro-variables of words ,symbols ,images, and designs .The intervening variables are defined as the independent variable of episodic memory with a focus on narratives ,thigmotaxis ,and patterns ,and its effects are measured by eventuality as a dependent variable with experientiality ,actionability ,and coexistence .Fig. 5 explains the relationship between variables and their micro-variables:

Research Methodology

• **Research method and theoretical research model**

The research method of this study is based on qualitative and descriptive methods. This method is conducted through the description and analysis of the spatial system and the symbolic system, and reviewing the behavior of users in the rows of the Sabzeh Meydan and the Mesgarha Bazaar using behavioral science and data mapping (Nasar, 2007).

• **Research operational model**

In the practical process of research ,the variable of

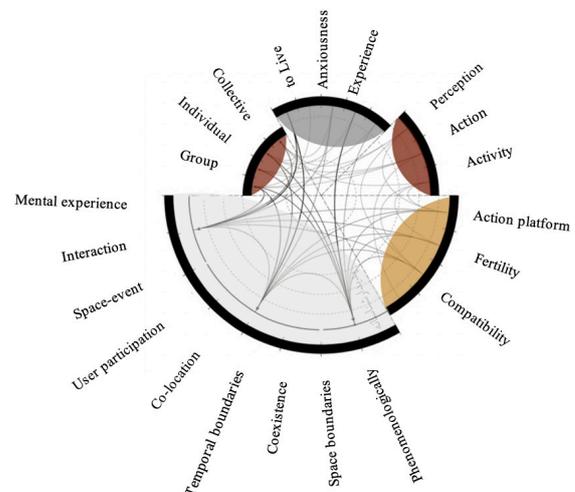


Fig. 4 .Focusing on events in architectural discourse .Source :Authors.

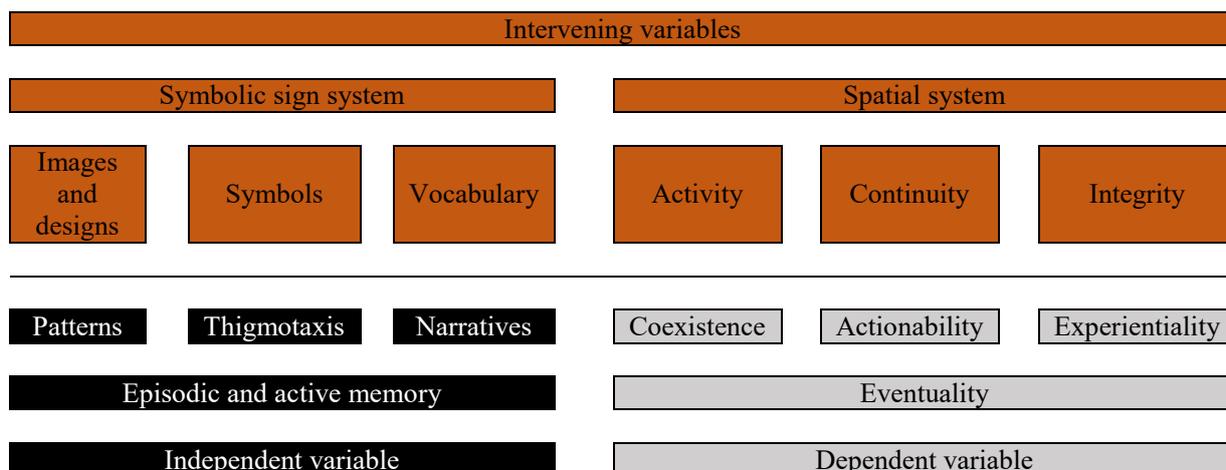


Fig. 5 .The relationship between variables and their micro-variables .Source :Authors.

the spatial system is recognized by the micro-variables of integration ,continuity ,and activity ;the symbolic system is recognized by the micro-variables of words, symbols ,designs ,and images ;the episodic memory is defined through narration ,thigmotaxis ,and patterns; and eventuality is recognized with micro-variables of experientiality ,actionability ,and coexistence.

The statistical population of this research is the area of the Sabzeh Meydan Bazaar and Mesgarha Bazaar ,including the main entrances ,the main rows ,the spaces between the two rows ,the entrance of the Grand Imam Mosque and the Chaharsuq-e-Bozorg .The reasons for choosing the Grand Bazaar of Tehran are its spatial quality ,symbolic quality ,and dynamic and lively activities that have not lost their importance and value in the passage of history, and it is a key recognizable point ,and it is considered a symbol of the old and new Tehran ,in which a significant space-activity diversity is always flowing .Also ,the two selected rows are considered the main routes of the market and the main entrances to other parts of the market ,and a significant population passes through them daily ,and they are in a way the main routes and directions in the market. To collect data ,firstly ,using the information of the detailed plan of Tehran ,detailed micro-scale maps of each of the selected rows were prepared ,and then by direct observation, the characteristics and features of the space were recorded, categorized, and encoded. The events and narrations were carried out in five-hour periods of two parts, from ten to fifteen and from twelve to seventeen,

in four periods and each row, from December 2021 until April 2022. The reason for choosing these periods is the importance of the market atmosphere before and after the Persian New Year. After observing and mapping the data at selected times, eight selection points and research variables were collected and recorded in each row to obtain the function of the spatial system, symbolic system, and eventuality. The eight points were selected based on formal-objective analyzes and based on the spatial structure and system.

The process of studies and maps are presented in Figs. 6- 8 the operational model, expresses the criteria of the research based on the observations of the research and the narration of the actors from the experienced space; Fig. 7 shows the behavior of actors in two rows of the market and explains the influencing factors on the episodic memory; Fig 8 shows the effectiveness of spatial systems and symbolic sign systems in the research cases.

Discussion and Research Findings

The data of research and analysis show: The average activity of the actors in the points where the spatial system is more structured has had a greater contribution compared to the symbolic system. Also, the factors that include the action and living of people in the space are recorded more in the long-term memory. In these cases, the actor records in his active memory some of the signs that are more associated with the audience’s mind in a selective-random process. This is

even though according to the principles of patterns, the seven-meter interval between the walls increases the possibility of recording in the memory, and it can be said that a change in the state of the spatial and symbolic system can lead to an increase in the 7 meters interval of patterns.

In the comparison of the rows of the bazaar, the entrance of Sabzeh Meydan and Chaharsuq-e-Bozorg has caused the most mental performance by the daily activities of the identifying actor, leading to memory creation. In the narratives related to Nowruz, due to the interaction with the historical corridors, the feeling of desire to live in the space and context and the possibility for reproducing the representation of a particular narrative in the space increases. This trend shows that during the Nowruz holidays, when the obligatory activities of the rows are relatively reduced, the eventuality of the space increases. Near the days of Nowruz and the last weeks of the year (Persian calendar), the events based on freedom, passion, and pleasure become more active, and the memory of events and making memories increases.

The spatial system, in which the walls are more continuous, by following the principle of thigmotaxis, increases the security of the space and its memory. The system of symbolic signs increases the understanding of space and its recording in episodic memory in humans.

Conclusion

This study sits within the scope of spatial research and spatial studies, and by analyzing data and research findings, it measured the relationship between the spatial system and the symbolic sign system in the case of Sabze Meydan and Mesgarah Bazaars. It has studied the relationship between the qualitative link of these two systems with eventuality and the effect on episodic memory. The following results have been extracted:

The use of different fields of cognitive sciences in architectural and spatial research can extend to cognitive issues, mind function and cognitive learning, episodic learning, and machine learning, and it can bypass mere behavioral studies, behavioral science, and space-behavior models.

The result of this research shows that the two spatial and symbolic systems have different contributions and effects on the active memory and eventuality of space. The spatial system advances the field of eventuality, endogenously, directly, immediately, and through spatial perception and experience; and the symbolic system provides the recognition of spatial components with an effect on human episodic memory indirectly through recording and rereading and with mediation.

Linking different layers and various spatial, symbolic, and other systems can increase the depth of cognition, learning, and recording in active and episodic memory.

In crowded spaces, complexity, and ambiguity need to be simplified through the integration of spatial and symbolic systems, so that the episodic memory can actively make the space experiential, and the experientiality can create a context for the eventuality.

The spatial system is more eventual in its highlighted parts, such as entrances and portals, paths and spatial walls, openings and squares, and open and intermediate spaces; they are also more receptive to narratives in conjunction with the symbolic system. The combination of spatial and symbolic systems provides a context and a platform for shaping the event narrative.

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Operational model, research criteria based on observations and narratives of actors from space.

The first stage: checking of the spatial codes of the market rows by the researcher - photographing the points in question. **The second stage:** using the map of the detailed plan of Tehran-Tehran Municipality and the specifications of the space of the rows. **The third stage:** direct observation, to record the events of each row and categorizing them in the sections of the spatial and symbolic system. **The fourth stage:** description of cases; spatial system, symbolic system and cognitive architecture. **The fifth stage:** tools and process of analysis, observation, recording and conversion of observations into maps, visits in order to examine people's episodic memory in the market space. **The sixth stage:** analysis by the researcher in line with the question and problem that the researcher is facing.

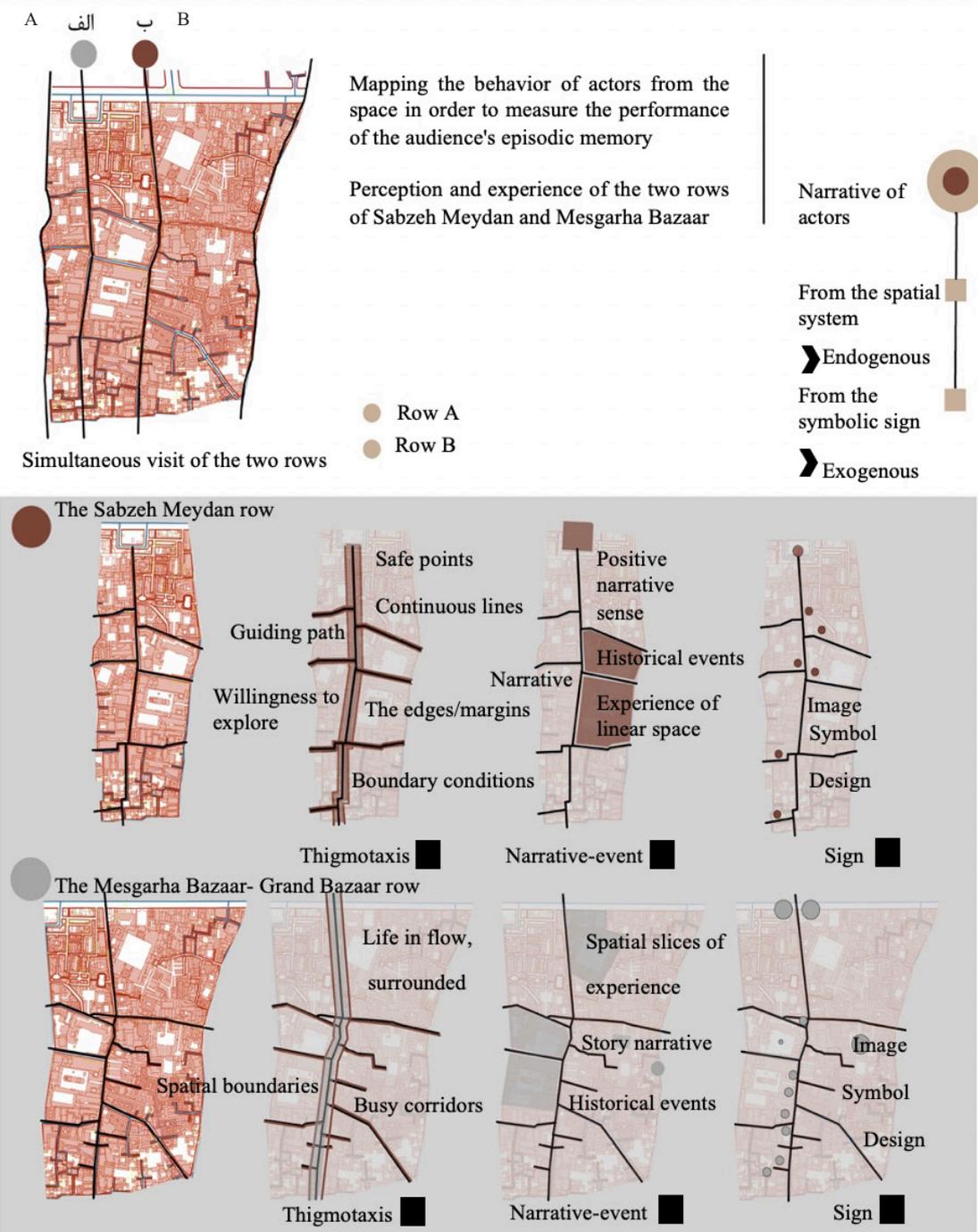


Fig. 6. Operating model diagram, research criteria based on observations and narratives of actors from space. Source: Authors.

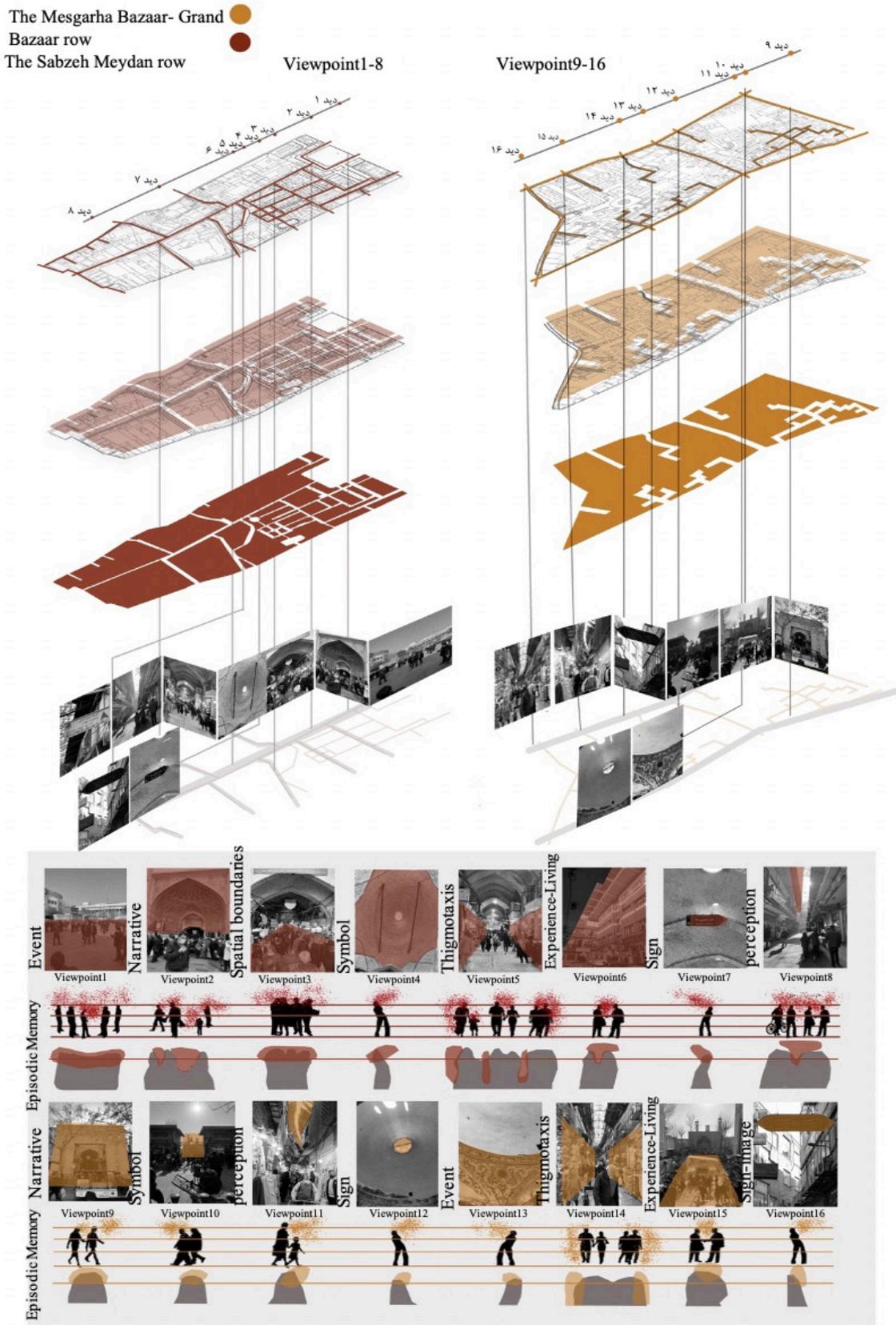


Fig. 7. Mapping the behavior of actors in the two rows of the market and examining the factors affecting human episodic memory. Source: Authors.

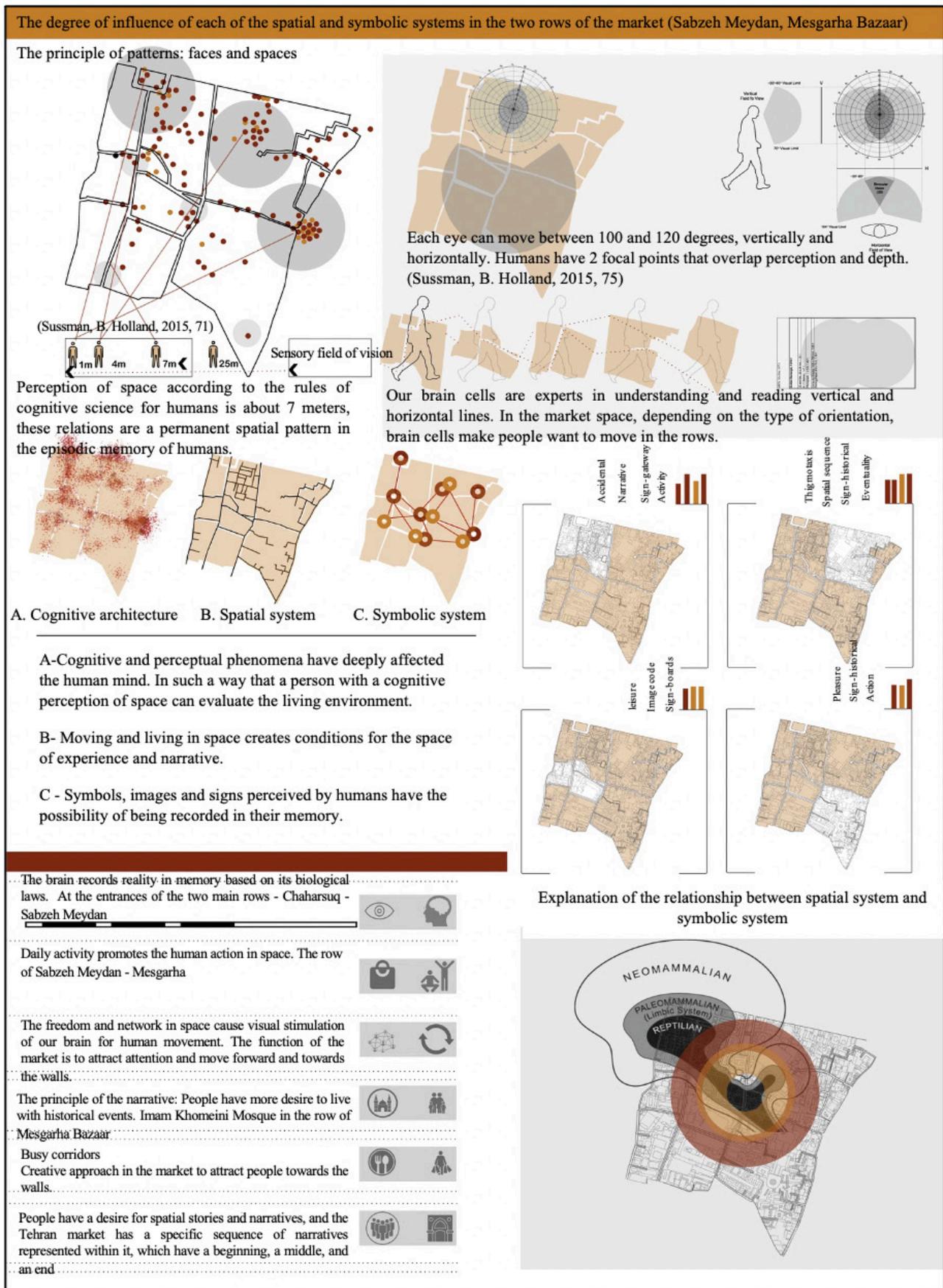


Fig. 8. The effectiveness of each of the spatial and sign systems in the two rows of the market. Source: Authors.

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