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## A Schematic Explanatory Pattern for the Psychological Process of Achieving Environmental Meaning and Actualizing Sense of Place Focusing on the Intervening Role of the Perception

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### Abstract

**Statement of the problem:** Today, the quality of achieving environmental meaning and subsequently the actualization of the sense of place in different levels has been specially considered due to its importance in architecture, especially with the emergence of the knowledge of environmental psychology. According to this and the belief in the dominant methodology propagated in behavioural sciences, it seems that attempting to explain the environmental design process in the form of common methods in other sciences and presenting it in descriptive patterns is one of the main goals of joining these areas of knowledge. The significance of this adaptation is considerable and covers the core of this research in point of the effectiveness of architectural products in the contemporary world. The current study attempts to answer the following questions: “what are the main effective physical factors in forming the environmental meaning and actualization of a sense of place? Moreover, what is their mechanism of action in the process? Also, how can it be described as a generative structural pattern?”

**Research Objective:** According to the above-mentioned subject, the main goal of this research is to investigate the state of achieving the environmental meaning and subsequently actualizing the sense of place. It is focused on its structural process by a systematic approach in a form of psychological pattern based on the levels of human existence.

**Methodology:** Regarding the exploratory nature of the study, a qualitative survey method entitled “Constructivist Grounded Theory” was chosen to identify the variables of the problem and deduce the relations between them. It should be noted that the semi-structured interviews with some specialists in the field of architecture and environmental design were utilized in this method, in addition to the descriptive-analytical strategy.

**Conclusion:** In this research, the importance of the variable “environmental perception” was focused, in different aspects, as the center of the considered process in the proposed pattern. Therefore, its key role in defining human expectations of the built environment and his behavioral reaction was emphasized as a result. Accordingly, a generative structural pattern consisting of three elements of “components, syntax, and meaning” is presented, which are equated with physical factors, environmental behavior, and environmental sense respectively. Finally, it could be claimed that the suggested pattern is capable of evaluating the existing environment purposefully and efficient in designing new environments.

**Keywords:** *Structural Generative Patterns; Perception; Environmental Affordances; Meaning; Sense of Place.*



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## Introduction

Architecture is one of the most significant artistic and applied fields affecting humanity and human culture, and therefore of great importance in human societies. Considering the growing expectations of this field to meet various human needs in different physical and non-physical aspects, the necessity to link it with psychology and application of behavioral science methods in design and critique of space has been especially focused recently. The outcome of this necessity was the development of the environmental psychology that is counted to be the common ground of behavioral sciences and environmental design knowledge including architecture. Explaining that it emphasizes the notion of being meaningfully systematic and structured about all the related issues and phenomena. In this regard, and in order to explain the structural process of achieving the meaning from the conduit of an architectural attempt, it is useful to address the subject of structural patterns or grammars that is prevalent in the domain of linguistic and subsequently non-linguistic areas. The importance of the patterns and their related concepts in environmental design sciences, especially architecture with the concern of providing a desirable quality in architectural spaces as one of the most important goals of architects and architectural researchers, is obvious. This architectural attention to the patterns is based on the tendency of designers to know about human experiences and previous related findings to reach the new better results. It should be noted that it is only possible to create architectural monuments, without the mere imitation and repetition, by utilizing such patterns (Soltani & Mansouri, 2012). Therefore, given that the ultimate goal of architecture and environmental psychology is to actualize high levels of the sense of place, the present study seeks to provide a generative pattern that generally involves the sequence of reaching this goal from the channel of the architectural design process. It is worth noting that several

attempts have been made in this regard, the most important of which are the fundamental studies of Stiny and Gips (1972), Stiny (1975; 1978; 1980), Alexander (1977; 1979), Hillier and Hanson (1984), Hillier (1996), Mayall and Hall (2000; 2005), each of them presented a structural pattern for the design process in a particular area and a special manner. The remarkable point in this regard is the exclusiveness of the patterns proposed by most of these studies to a particular scope of design. In addition, the lack of attention to the psychological dimensions of the process in the relation between human and his physical environment is important. Therefore, a systematic and psychological approach to different existential aspects of the human as the user of architectural products has been used in this research. Describing that it is concentrated on the question "How do physical factors (influenced by the human perceptual mechanism) cause the formation of the environmental meaning and subsequently a sense of place?". In other words, at a macro level, can the process of the formation and perception of the meaning and subsequently the environmental sense be explained as a general pattern? And at a micro level, what physical factors and psychological elements are of importance in this process?

## Research Background

Providing a general structure for explaining how to approach to the environmental meaning, the enhancement of the beauty, and subsequently, the actualization of the sense of place has been researched from different perspectives in the design knowledge. It should be noted that the roots of these attempts are inspired by researchers from various fields about structural patterns and grammatical rules of language, which led to the development of the shape grammars, or in other words, attempts to formulate the beauty. In this regard, Stiny and Gips (1972), introduced the grammatical rules related to shapes and their application as a primary production method in a paper entitled "Shape

grammars and the generative specification of painting and sculpture". Citing Birkhoff's (1932) research entitled "A mathematical theory of aesthetics", and Eysenck's (1941) study, entitled "The empirical determination of an aesthetic formula", attempted to use a formula for explaining beauty rather than a philosophical approach to it. According to them, the product and the output of these shape grammars include artistic works with the simplicity and clarity of the features, and at the same time high visual complexity that will be very difficult to achieve with other tools (Stiny & Gips, 1972). Following this research, Stiny expanded his ideas on grammatical rules for constructing shapes and presented formal models in his research that allowed exploring some opportunities for achieving an algorithmic formulation of beauty. He emphasizes, in particular, the Euclidean geometrics attributed to the procedure of constructing shapes, including turning, rotation, reflection, scale change, and composition (Stiny, 1980), and states that the original pure shapes form the components of his proposed pattern and the syntax or the structural order governing them is the set of rules for combining shapes in the Euclidean geometry. Explaining that the meaning achieved by the process of the syntax's effect on the components is equivalent to the final appropriate design or shape. Stiny's attempts have attracted the attention of many scholars in various areas and fields and thus his role in creating an official context for defining algorithmic language in 2D and 3D design based on the concept of transformation of the shape by the Euclidean geometry processes is imperative. With the advancement and transformation of shape grammars, two different functions were created which, on one hand, focused on analyzing and evaluating an existing work, and on the other hand were useful in designing and producing a new work. Accordingly, the desire to analyze many valuable artworks was generated from this perspective, especially in the field of architecture. One obvious example is architecture of the

Italian architect Palladio which was built in the Renaissance, its structural design rules was based on the Golden Ratio (Sass, 2007). The study of the formal structure of Palladio's buildings was made by scholars such as Stiny (1978), Shin (1996), March (1999), and Sass (2007). The other example that have addressed the architectural design rules include the Japanese cafes (Knight, 1981), the churches of Wren (Buelinckx 1993), the traditional Turkish houses (Cagdas, 1996), the windows of buildings in Wright's works (Rollo, 1995), landscape architecture (Mayall & Hall, 2007; 2005), and individuals' movement pattern in open spaces (Hillier & Hansen, 1984; Hillier, 1996). The progress of these rules from the content dimension, especially with regard to the psychological issues associated with the user of products, is a milestone in this area of knowledge. In this regard, studies by Alexander et al. (1977, 1979) and Pallasmaa (2005) led to the fact that the meaning of an environment is completely correlated with how it affects individuals. Here, Alexander states that the main criterion of every living environment for the promotion of human morale is an intrinsic qualitative property that counts the permanent search of the human in his life. In fact, this search is conducted to achieve moments and situations that make the human feel more liveliness (Alexander, 1979). In line with this concept, Csikszentmihalyi uses the term "transcendental experience" and states that this optimal experience can be called "flow". The result of his research on many individuals indicated that this sense of optimality occurs when things are routinely performed without special effort, while their high-level consciousness and self-awareness proceeds (Csikszentmihalyi, 1996). Therefore, it can be inferred that in Alexander's (1979) Pattern language and Csikszentmihalyi's (1975) theory of flow, the intended psychological meanings have become synonymous with architectural meanings. This attitude suggests a high degree of the sense of place in human life and a significant part of it, or

in other words, the meaning of place is determined by environment physical factors and their capacity to meet the needs of the user. As Alexander (1977; 1979) devoted himself to providing a set of patterns that can be applied in the design and construction of physical environments in a cooperative endeavor (the possibility of user intervention), and in this form, he raised the fundamental principles and source of access to a timeless way of building. In this relation, Jorgensen and Stedman (2001), in their paper entitled "Sense of place as an attachment: Lakeshore owners' attitudes toward their properties" presented a model in which the behavioral dimension of place is attributed to function, its emotional dimension to meaning and its cognitive dimension to form, although it seems that all of these dimensions are overlapping and not easily separable. Scannell and Gifford (2010) also in a paper entitled "Defining place attachment: A tripartite organizing framework" depicted their approach in a three-dimensional, person-process-place organizing framework: Person (individual and social, influenced by history and culture), psychic process (affect, perception, cognition, and behavior) and place (including social and physical press). With more explanation, the person in the model refers to empirical meanings derived from the place for its user, the process involves the psychological dimensions of affect (happiness, pride, and interest), perception and cognition (memory, knowledge, and subjectivities), and behavior (seclusion or proximity and participation in reconstruction) in place, and ultimately the place, concentrating on spatio-physical characteristics (natural or built environment) and social memories (public spaces and collective signs and symbols) (Scannell & Gifford, 2010; Najafi & Kamal M S, 2012; Gifford 2014). The totality of this model is significant, and on a macro scale, it emphasizes all the elements involved in creating the environmental meaning and sense of place. However, on a micro scale and in relation to physical space, it does not address their details

and mechanisms of action. Scannell and Gifford (2017) in another paper published in the Journal of Environmental Psychology, emphasizing the type of cognitive-emotional for this sense and, using a quantitative content analysis method, present 13 categories of the benefits raised of a high degree of the place attachment, including memories, belonging, relaxation, positive emotions, support for activities, security, self-actualization, freedom, entertainment, connection to nature, pragmatism, privacy, and aesthetics.

In this regard, Lewicka (2011a) in a comprehensive review studies hundreds of papers that were published since 1970 on the environmental meaning and the sense of place, finally, based on the three-side model of Scannell and Gifford (2010), she posits that the majority of related research in this area emphasized the subject of people and individual differences (one of the sides of the above-mentioned model). In the other words, Lewicka's conclusions imply the vast expansion of variability of the intervening variable of perception in the process discussed and, thus, its significance (Lewicka, 2011b, c).

It is necessary to mention the studies in Iran in this area, which are directly or indirectly related to the subject of this research. For instance, in a paper entitled "The concept of sense of place and its constituent factors" Falahat (2006) introduced the sense of place as one of the results of the inner connection of human and the environmental properties based on his mental imaginations. Despite the fact that the proposed model of his research does not link meaning to the activities occurring in the environment, it perceives both as the factors that lead to the emergence of a sense of place under the influence of physical characteristics of an environment. Likewise, Alalhesabi (2017), in a paper entitled "Presenting a conceptual model for meaning of place and its continuity indexes (interpretative phenomenological analysis of persons' lived experiences)", applies the principles of semiotics and the phenomenological approach

to examine place meaning, and validates the results through a survey of environmental users. Accordingly, he acknowledges that the relationship between human and his environment contains several indicators, among which the two indicators of functional vitality and content richness of activities have the most semantic references.

It should be noted that the present research was based on the above-mentioned research, and in particular the research by Alexander and the others (Alexander, Ishikawa, Silverstein, Jacobson, Fiksdahl-King & Angel, 1977; Alexander, 1979), and sought to develop a general Pattern based on how to achieve the meaning and the emergence of environmental perception on the scale of architecture.

### Methodology

With respect to the goal, the present study has exploratory features and attempts to find effective physical factors and the processing mechanism causing the important event of the sense of place. Therefore, it focuses on the quiddity of the mechanism of action in the process of forming the meaning and attempts to complete the existing theories on this issue. Accordingly, it is a developmental type of research that the applied role of which is of importance due to the applicability of the results in the real world. In accordance with the nature of the research problem, the Constructivist Grounded Theory (Glaser & Strauss, 1967) was used to confirm or reject the hypothesis of the study by collecting and analyzing the data based on a traditional research approach. The difference here is that the initial hypothesis does not exist accurately, and it gradually forms through the answer to the original question of the research (Blumer, 1969). The constructivist grounded theory (Charmaz, 2000) uses the framework of common grounded theory and extends it from the roots of mere rationalism to a constructive interpretable state. Arguing that the knowledge is a set of human-authored structures (Raskin, 2002) rather than the

unbiased discovery of objective truths (Castello & Botella, 2006), i.e. the meaning can always be changed in an interpretative process. Charmaz (2000) states that grounded theory, which is based on the opinion of the relevant experienced experts, should be enriched by a constructivist approach (interpretive intervention of the researcher). Therefore, the meaning intended in the research is a structured meaning of the truth.

In the context of such research, Glaser encourages researchers to use their professional and personal experiences to gain a deep knowledge of grounded data, as this experience has often been very effective in shaping and acquiring the cognition of the original question integrity, and subsequently, it stimulates the research analytical process. It should also be noted that one of the basic principles of this method is the possibility of regressing and distancing from the data in order to create abstract conceptual models of them (Glaser, 1992), which can be seen in the present research. This principle is a way of controlling the researcher's tendency to categorize data partially and allows data to be categorized according to their nature (Glaser, 1992). In grounded theory, access to data continues until different categories are saturated in the classification of information (repeating the findings). It should be noted that the selection of this method was due to its appropriateness to the exploratory nature of the problem, accurate structuredness and comparison of the data obtained (Pidgeon & Henwood, 1996), the emergence of basic findings and concepts under theoretical and subsequently exploratory development processes (Furniss, Blandford & Curzon, 2011), approaching the optimal results of the research process at the right time, repeated accurate findings, and as a result ultimate maturity and high citation capability.

The progress of the research within the framework of the above-mentioned method was as follows: After a detailed review of the related literature and utilizing the professional experiences of the researchers with the subject, semi-structured



interviews were designed and conducted with 12 experts in the field of architecture and environmental design in order to investigate the subject matter. The main purpose of these interviews was to clarify aspects of physical environment perceived by individuals as enhancing the meaning and perception of the environment. The interviewees were architecture or urbanism teachers from the state and non-state universities with a range of 35-60 years old, different working and educational backgrounds (5 to 30 years old) and different academic degrees and equal gender distribution (6 women and 6 men). It is noteworthy that the selection of these individuals was conducted through convenience (available) sampling and the subjects were exposed to the same targeted questions. These interviews usually began with general questions about the individual's interpretation and definition of environmental meaning and its nature, and ultimately focused on a central question: "When you feel fine, where are you, and how do you do?" Then, the details of the problem were processed with a series of supplementary questions. The data obtained in the form of a sentence, phrase or even a word expressing a significant sense of the interviewee was collected and classified as information units. However, it should be noted that at first all data were merely collected and then similar data were categorized and coded to minimize the orientation error during data collection in this process and to facilitate the content required for analysis in the later stages. In the initial classification of these data units, the analytical findings of the literature review were used, and as mentioned earlier at the next stage, data replication or in other words, the information saturation obtained from the interviews in each category was considered as the verification criteria. Finally, the logical reasoning was used to interpret and elucidate the results and the comparative-interpretive intervention of the researchers was performed in order to approach the theory.

### **Theoretical foundations and framework**

Regarding the subject of the research and

its multidimensional nature, the theoretical foundations of the study are presented in two parts: environmental psychology and grammatical rules, each of which describes the structures and concepts required by the analytical section of the paper in detail and finally the theoretical framework of the research is presented in the form of a conceptual model.

### **Environmental psychology**

Psychology emerged in the late seventeenth century as a science. This knowledge is based on the practical study of human behavior and mental processes under various approaches. In this regard, it should be noted that one of the most important aspects of human behavior is realized in the face of the environment and the importance of this issue and its impact on human life has led to the emergence of a branch of psychology called environmental psychology. While its necessity had been perceived even before the advent of it and Churchill for example, had stated in 1943 that we shape the form of buildings and thereafter they shape us (Churchill in Gosling, 2014). Nevertheless, the subject of environmental psychology was raised in the late 1960s. Proshansky, Ittelson, and Rivlin, in 1970, announced the emergence of environmental psychology in a book entitled "Environmental Psychology: Man and his physical Setting" (Lang, 1987).

Modern architecture movements and critiques of the tedious crime-generating spaces in modern residential complexes and cities can also be known as a starting point to the necessity to take into account the psychological needs of humans from the desirable environment and the necessity of forming this field of knowledge. In this scientific expansion, the human built environment considered as the container of his behaviors and activities and is introduced and studied as a "Behavioral Setting". Therefore, the basic assumption is that the human behavior and experiences cannot be measured without regard to the environmental conditions and

in isolation. As Alexander argues, “the pattern of events dominated the living in buildings and cities can not be separated from the spaces in which they occur” (Alexander, 1979: 61). Hence, it can be suggested that the relationship between human and environment is a bilateral relationship made through perception. If the human being or the perceiver of space is regarded as a subjectivity and the surrounding environment (the perceived space) as objectivity, the relationship of subjectivity and objectivity is a dialectical relationship which has discourse and environmental psychology is focused on it (Nasirsalami & Sohangir, 2013).

### **Environmental perception**

The human perceptual system is responsible for the communications between him and his environment, containing some limitations inevitably. Therefore, it can not to intervene and design the environment without regard to the processes of environmental perception and the related mechanisms of action in the mind of environmental users. In other words, this is the man’s perception that guides him to interpret the environment, which mainly manifests itself in the form of his environmental behavior (Barati & Soleiman nezhad, 2011). Describing that the environmental information is achieved through perceptual processes that are motivated by mental schemas and driven by human needs and, of course, human motives. These schemas are partly innate and partly acquirable and establish a fundamental link between the events of perception and cognition. They guide not only the perceptual processes, but also the emotional reactions and the quality of the spatial behavior, and in turn, these processes and reactions also affect mental schemas as the result of the perceived behavior. In this regard, Ittelson et al. (1974) emphasize four different dimensions of perception, including cognitive, emotional, interpretive, and evaluative that act simultaneously. Accordingly, the categorization of the source of human perception in relation to the environment can be defined as three classes: operational, reactive-

emotional and inferential (Nouri Motlagh, 2010), each focusing on particular aspects of the physical environment.

Given the aforementioned, it can be argued that perception is not a biological process alone, but it is learned through social and cultural relations. Although all people have similar senses, they differ in how they choose, organize, value and respond to what they feel. Differences in the environmental perception can be due to factors such as age, gender, ethnicity, lifestyle, the period of living in a location, and the effects of the physical, social, and cultural environment wherein a person has a continuous presence. In this regard, the issue of motivation and its relation to the need should be paid special attention. Human has various physical, psychological and spiritual motives. Motivation is the force that guides and organizes human perception, cognition, and purposeful behavior, and behavior is also taken as to satisfy the needs. Hence, recognizing human needs for environmental designers is of particular significance and according to Maslow, in order to meet these needs, human motivation must be considered important. Lang believes that human needs cause his motivation. Contrary to Lang’s idea, Motalebi believes that motivation is of primacy over needs. He justifies this issue by referring to Maslow’s (1954) book, “Motivation and personality” (Motalebi, 2015). In this regard, it can be stated that the primacy of motivation over need holds true for the basic human needs. However, in the case of secondary and higher needs in different people with different personality traits, motivation antecedes need. It is worth pointing out that architecture acts to address both human needs, especially higher needs, and therefore the role of motivation is emphasized. Table 1 describes some of the commonly used practices in design as a ground for motivation and satisfaction of user needs at different levels.

### **Environmental affordances**

The term “affordance” was introduced by Gibson in

1977. He believes that the combination of various constituent materials of the universe reveals the discovery of some environmental affordances. Human transforms the levels of the physical

environment in order to adapt the environmental affordances to his own needs (Motalebi, 2001). “In fact, the physical environment is composed of a set of levels and the human changes these levels

Table 1. Motivational factors emphasized in environmental design to address different levels of user needs. Source: Authors.

Human needs	The quality of design’s intervention in the realization of goals
<b>Physiological</b>	Adjusting climatic conditions - Providing welfare services - Providing health services, etc.
<b>Safety and security</b>	Creating safe and secure pathways - Creating visual limitations in places requiring confidentiality - Creating safe spaces with proper elements and materials to prevent damage, etc.
<b>Love/belonging</b>	Creating environments enabling group activities - Creating collective spaces for the quantitative and qualitative promotion of relationships - Promoting features such as intimacy and inviting for the environment using elements with memorable and associative attributes, etc.
<b>Self-Esteem</b>	Creating a sense of domination over the environment with strategies such as adjusting vision axes and regulated perspectives, etc.
<b>Self-Actualization</b>	Creating personal spaces - Creating enough space for the realization of territory - Improving features such as complexity, contrast, etc. for visual enhancement - Places for self-presentation - Creating curiosity motivating spaces, etc.
<b>Perceptual and cognitive</b>	Considering spaces for significant and prominent activities - Promoting the adaptability of environment with personalized activities - Creating diversity in space design (for selective use) - Ability to perform practical tasks in natural environments – Inducing perceptible complexity for the growth of thinking and mental activities - Enhancing the attributes of joy, liveliness, etc.
<b>Aesthetic</b>	The use of nature even in closed spaces - The use of beautifying elements and structures - The use of symbols and signs to induce meanings and create a sense of beauty - The use of appropriate colors and lighting, etc.

to construct buildings and thus he changes the meanings of the levels of the built environment” (Mortazavi, 2001: 73). In Gibson’s view, “a building proposes something by its own nature” (Lang, 1987: 91). Evidently, it should be noted that the affordances of an object or an environment are based on the observer’s properties, experiences, competencies, and needs. “An environment may have specific affordances for a particular person. But at the same time, for someone else, these affordances (mostly because of the lack of knowledge of their existence) are meaningless and their environment does not reveal them” (Motalebi, 2001: 62). In fact, due to these potential and varying affordances, concepts such as meaning, beauty, and acceptance are shaped and actualized

by the user. Therefore, it must be acknowledged that human emotions and actions are limited by the affordances of the man-made environment (Lang, 1980).

### Meaning and beauty

Environmental meaning and architectural beauty are two separate, yet interrelated concepts dependent on human emotional and psychological values that are received through sensory perceptions. In fact, the meaning can be regarded as the value of art, as “meaning and evaluation are fundamentally interdependent and interrelated” (Kelly, Winters & Cooper, 1991: 36). Likewise, “the meaning of an environment is the result of the interaction between the affordances of that environment and the



individual and social needs of its users” (Motalebi, 2001: 63). Therefore, the concern of architecture and meaningful environmental design is to identify and introduce the meanings and concepts latent in the environment or architectural work. In other words, a work of art is a tool for the transmission of spiritual and semantic messages. Beauty is also referred to as a condition that is primarily attributed to the feeling of pleasure (due to the perception of the meaning), and therefore these two concepts are the joint subject of architecture and humanities, including psychology, due to the presence of emotion and thought. The comparison of the researchers’ and experts’ views in this regard is presented in Table 2.

Tuan and Relph believed that a place is more than space when it has three properties of physical scope, activity, and meaning, meanwhile, they know the meaning as an essential constituent of this important matter (Tuan, 1974; Relph, 1976). Canter (1986) also proposed the concept of “The Facet of Place” and classified four relevant elements in one place, including functional differences (activities in place), place goals (concepts and meanings of place), interaction scale (environment size), and

design parts (physical components of place). In this regard, Gostafson (2001) describes the three-polar individual-others-environment approach as a fundamental model in the formation of meaning based on the comparison of Canter’s and Relph’s ideas. Therefore, in identifying and explaining the environmental motives of user participation in the environment (as the interconnected area of his model poles) he referred to three different types: the social motives to enhance the quality of environment and to share the feeling of well-being with others, the personal interest-driven motives, especially in relation to the improvement of individual position in the social and political environment, and ultimately the motives of professional and competence, separated of the two preceding ones (Gustafson & Herting, 2016). Thus, it seems that as human needs vary at different levels and conditions, the meaning of environment should also be examined at various levels. In this relation, the classification proposed by Gibson can be considered in Table 3. With regard to the above-mentioned discussions and categorizations, the closeness of the concepts of meaning and beauty has been revealed and it can be concluded that the

Table 2. Comparison of the major views about the place and its Meaning. Source: Authors.

No.	Theoretician	Date	Viewpoint
1	Relph	1976	The major elements of a place include: the relationship of the physical setting with the current activities in it and the meaning of them
2	Canter	1977	Similar to Relph’s view
3	Rappaport	1982	The meaning of an environment is shaped by the people through their culture (values, beliefs, ideology, etc.)
4	Lynch	1984	The main meaning of a place results from the relationship of the physical elements of space with mental patterns
5	Agniou	1987	The main components of the place consist of the context, position, and the sense of place (meaning)
6	Altman	1992	Place is a space that becomes meaningful in an individual or group cultural process
7	Girin	2000	Place consists of three components: special geographical location, physical form, and identity (meaning and value)
8	Gustafson	2001	The meaning of the place is the interactive result of the three parameters of individual, environment, and others
9	Vanderklis	2009	The meaning of the place is derived from three factors: the physical, functional and social environment

beauty and levels of perception of it are determined for each person depending on the environmental meaning and the perceptible existence degree thereof.

### Sense of place

One of the important and effective concepts in relation to human and his environment is the sense of place that is considered among the basic criteria for assessing the quality of environments. This is a witness of achieving the environmental meaning and has different levels representing a range of relations between a person and surrounding environment. Shamai (1991) refers to three main levels of belonging, attachment, and commitment to place in relation to the formation of different levels of the sense of place, and categorizes this sense in seven degrees that are: the indifference towards a place, awareness of being in a place, belonging, attachment, uniting with the goals of a place, enchanting, and eventually sacrificing for a place. Explaining that the first two levels include mainly the perceptual and cognitive aspects of the person relative to the environment, and from the third level on, its emotional aspects are revealed. The results of past researches have shown that physical factors of the environment play the role of mediators in the formation of a sense of place and can be effective at two levels (Javan Forouzandeh & Motalebi, 2011): 1. The satisfaction of individual (first) and social needs arising from the collective

activities (at a later stage) by coordinating with the activities and afford them, and 2. Establishing a visual interface for creating a connection between the user's mind and place as cultural elements and symbols. These effects are reflected in a variety of dimensions, so that they are manifested within the domain of perception and cognition by defining territory and privacy, enclosure of space, physical distinction between places, connection between indoor and outdoor environments, legibility and adaptation to the patterns of behavior, etc., and in the emotional dimension by representing the physical form of symbols, memories and mental images of human. There are different approaches to this, most notably in the fields of phenomenology, ontology, and environmental psychology.

Within the phenomenological approach, Relph (1976) considers a place to be a combination of natural and man-made objects, activities (functions), and meanings whose experience is possible on a variety of scales. As noted earlier, in his view, a place has three properties: physical scope, activities, and meanings that take it out of space and transform into a place with a mental experience for the individual. In this approach, the experience is the main indicator of the perception of concepts and meaning of a place and hence meaning is directly related to the quality of human perception and its related categories (Bonito et al., 1999; Hidalgo, et al., 2001). On the other hand, Schulz uses this attitude to reveal the meaning

Table 3. Different levels of the built environmental meaning. Source: Gibson, 1977.

Levels of meaning	Focus	Description
1	Statics and Stability	Emphasis on physical resistance and stability of the building
2	Usefulness	Ability to use the building properly in a certain or unexpected function
3	Functional	A certain and predetermined function of the building
4	Value-Based	A dimension of the building related to the user's emotions
5	Semiotic	Meanings and concepts related to other human domains
6	Symbolic	A certain level of Semiotic meaning focused on immaterial meanings and concepts latent in the physical form of the building

and sense through which the person gives identity to place in connection with other people (Schulz, 1971). In addition to personal feelings, Manzo (2006) emphasizes the social feelings of people based on society, politics, and economics in the relationship between the individuals and their environment, the formation of the environmental meaning, and subsequently, the sense of place for them. Citing this, he distinguishes the way people perceive the environment categorized by gender, race, culture, nationality, and ultimately, state of groups' behavior towards their environment. In considering the nature and dimensions of the sense of place with an ontological attitude, attention is made to human needs and various models have been proposed for its explanation, among which Maslow's Human Needs Pyramid Model (1954) has gained a special niche in the development of theoretical foundations of designing. While stressing human motivation and needs, Maslow considers them in accompanying with the man from his birth and believes that human seeks to meet his needs at different levels through the interaction with the environment and by changing its capabilities. Likewise, within the realm of environmental psychology, the variety of semantic approaches to the relationship between human and place could be explored in cognitive (referring to familiar places), social (places fostering social interactions) and emotional (places with emotional attachability) categories (Javan Forouzandeh & Motalebi, 2011). Morgan (2010), in another approach of studying, points out the sense of place, especially at the level of attachment as an expandable sense, and tries to present a framework for its development with emphasis on the childhood. In this approach, the sense of attachment to a place is of a latent and subconscious essence, associated with the enhancement of the child's bonds to the context and long-term experience of being in the environment. But Lewicka knows the concept of the sense of place and its state of formation evolving in the contemporary world, based on the

transition of today's societies from the traditional life (with contextual bonds, dependence on the family, and consequently, a long-time presence in a place) to a modern one (prevalence of civilization, advancement of education, immigration, and economic prosperity), that has changed from a traditional, subconscious and intrinsic sense to an active, self-conscious, and apparent one (Lewicka, 2011b, 2014; Jaskiewicz, 2015).

Using these approaches in the form of a general one, it can be argued that architecture and its basic constituent elements in two macro concepts of "form" and "function" are suited to meet human needs and thus actualize a high degree of sense of place.

### **The ratio of form-function concerning the environmental beauty and actualization of the sense of place**

The relationship between two pillars of "form" and "function" has always been discussed by various theorists of architecture and from the advent of modern architecture on, the maxim "Form Follows Function" has been considered especially. This implies that the function and its corresponding form follow the human needs directly and indirectly respectively. However, the modern architecture movement did not succeed in explaining the relationship between these phenomena because of the paucity of adequate understanding the multidimensional nature of the man and his needs and subsequently providing a partial picture of the concept of function as a means of fulfilling many needs. In other words, firstly, due to the multiplicity of users' potential needs, the multiplicity of functions must be considered, and secondly, the relationship existing in this proposition should not be expressed as causal. Instead, it should represent a correlation type, because form appears to have other correlates than function. So this maxim should be presented in the form of "form flows functions as well". Interesting efforts have been made to correct this maxim, including Venturi's

(1966) "Form evokes function" and Motalebi's (2006) "Form affords functions", each carrying some valuable concepts and ideas.

Analyzing this issue, attention should be paid to all-inclusive physical, psychological and spiritual needs, such that the concept of usefulness in its physical and non-physical (psychological) dimensions lies in the definition of the function. However, the spiritual affairs are beyond this definition and should be interpreted as Meta functional. Therefore, it can be argued that the new theories of behavioral science in architecture concerning the dominance of the term function on all the aesthetic issues, is an extreme position in contrast in the maxim of modern architecture, while the point should be discussed with an attitude between these two extremes. Since a large part of the aesthetic subject returns to human spiritual affairs and his beliefs, and on this basis, meaning orientation, symbolism, and subsequently, sense of beauty cannot fully fit within the scope of the function at all levels. Therefore, a form must meet and afford functions and evoke beyond it. The interstitial attitude of the present research in this regard divides human demands into two categories of functional (physical and psychological) and Meta functional (spiritual). Explaining that the concept of beauty in various levels covers its psychological and spiritual parts. In this categorization, functional demands include physical and psychological affairs and responding to them is entirely within the exclusive domain of science (positive theories), while Meta functional demands are based on the ideology and the system of human beliefs, they are not fully subjected to scientific methods and require other means (normative theories). Therefore, the concept of function as far as the level of human mind and psyche is concerned, is the subject of science that covers the concept of beauty and does not go beyond where the boundaries of individual belief and worldview begin.

### **Grammatical rules and structural generative patterns**

The term "structural patterns" was originally introduced in the field of linguistics, under the heading of Grammar. This term refers to a set of rules for the ordering and presentation of language components (Chomsky, 1957; Lyons, 1970; Thomas, 1993), or in other words, the coding of the linguistic coordinates of a particular group of users of a language (Kress & Van Leeuwen, 2002), which subsequently became popular in non-linguistic areas as well. The three basic elements that apply to all the studies in relation to these structural rules are as follows: 1. Components or constituents (including vocabulary, sounds, shapes, symbols, and motions dependent on the language under consideration); 2. Syntax or the structural system governing the above-mentioned components and constituents; and 3. Meaning and concept resulting from the particular combination of the two preceding elements. For the explanation of each one, it should be informed that the components refer to a complete set of language constituents that can be accessed by each user, the structural system deals with the rules and how they are used to linking the components, and meaning is the result of the system's operation on components, which can be interpreted.

Within the domain of language, to determine whether a sentence is grammatically accurate and optimal, only its components (words) combination, or in other words its structural system (syntax) are considered (Thomas, 1993). In this regard, Chomsky states that, firstly, there is no direct relationship between the semantic studies in language and the subject of determining the grammatical accuracy in a particular statement or speech; secondly, grammar is completely independent and non-affiliated with meaning (Chomsky, 1957). There are many discussions about Chomsky's remarks about the priority of the syntax to meanings in his generative grammar. Some linguists such as Lakoff, Langacker, and Goldberg have introduced

other grammatical patterns in which a combination of syntax and meaning play a central role. Some critics of Chomsky, such as Minsky and Schank, have known the access to meaning without a syntax possible, but they consider it impossible to approach a syntax without meaning. Others, like Pinker, know both dimensions of importance (Pinker, 2000). Anyway, Chomsky's theory of structural generative pattern suggests a systematic set of rules capable of generating an unlimited number of grammatical structures in the domain of language, which refers to the production of all possible sentences from the combination of words in a language, and leads to an infinite and abstract set of unique interpretations (Chomsky, 1969). Since Optimal accuracy, he believes, is dependent on syntax and semantic components have no effects therein, thus, there is the possibility of using this systematic grammatical framework in all disciplines, because this set of rules is taken from an algorithm and it is possible to develop structural rules beyond the boundaries of the linguistic realm. The lack of dependence of Chomsky's generative grammar on meaning, justifies its effective application beyond linguistics studies in other disciplines, in particular, studies on visual issues such as design and architecture. In this regard, Stiny and Gips (1972) first introduced the language of the shape pattern and its application. Specifically, Stiny's efforts attracted the attention of many scholars to the application of this type of grammatical rules in various disciplines. Similarly, patterns related to shapes and subsequently visual perception of space has three main elements of components, syntax, and meaning like the structural rules of language. Here are two basic aspects of meaning (Ching, 1979): 1. Descriptive meaning that has an apparent aspect; and 2. Symbolic meaning that has an implicit aspect and is related to the extent of signifier and signified. The descriptive meaning in the structural pattern of an environment implies the physical factors of that space, which in some way leads to the stimulation

of individuals and the emergence and supply of a particular behavior. The implicit meaning in the above-mentioned pattern is that an environment produces collective values and symbolic content that can be interpreted individually and culturally for persons and groups, e.g. Feeling secure or inviting for users in a space.

In his definition, Stiny introduces the meaning as a categorization system by which the artist makes possible to understand objects and elements and consolidate their various properties and features (Stiny, 1985). He states that, as Chomsky contends, generativeness does not simply cover everything that exists. Working with shapes and rules governing them in formal patterns requires creativity as much as or more than working with vocabulary and grammatical rules between them. When rules are applied, components and parts are changed. Thus, there is no end to it and when one chooses to see again, the meaning is also re-emerging. This is a visual calculation and depends on the design and its quality. Simultaneously, when one encounters the subject of meaning and its interpretation, individual habits appear to be very influential (Stiny, 2006).

### **The proposed pattern and the conceptual model of the research**

The basis of the proposed pattern of the present research is the development of a model called the interaction model of environmental behavior, based on the models presented by Franck (1984) that can be seen in Figure 1. In Franck's model, perception is an intervening variable, and she refers to Gans (1968) affirming that an objective environment must be perceived mentally before influencing the behavior. Emphasizing the role of perception in her model, Franck also quotes Lang's: the environment is a set of behavioral settings that provide affordances for physical comfort, activities, and aesthetic satisfaction in general. Therefore, if there is sufficient talent and suitable background in the users of an environment and these affordances are



understood properly, the environment becomes an effective (actualized) environment (Lang in Franck, 1984). With this explanation, the model depicts a process that emphasizes an inevitable mediator (the variable of perception) to include all observable effects of the environment on behavior. Besides, three independent variables, including individual characteristics, social press, and physical environment, and of course, their interaction and combined effects are discussed in the model. The purpose of this model is to find out how to achieve the dependent variable of environmental meaning and subsequently the output of behavior through the intervening variable of perception. Based on this, a behavior is motivated by the user's perceived meaning and in response to it. The individual's perception of the environment also depends on his personality traits, skills, ideology, and social culture. In this sense, perception can be defined in two ways: first, as a visual process through which an object is understood, such that the constant composition of its features is meaningful to the user (Gibson, 1977). This meaning attributed to the object by the observer is comparably examined as the capacity of the object in meeting the observer's behavior and as much his perceptual ability. It should be noted that Manzo (2003) knows the relationship of the man with his environment dynamic even about a particular person, permanently vary according to his various conditions, which reflects the variability of perception and cognition not only among different persons but also for a particular one in his different situations. The second aspect of the mediator of perception is its effect on the soul (the material dimension of the spirit) (Russ, 1993). This is based on Gans' (1968) premise that mental perception of the objective environment is necessary before its effect on behavior.

After explaining the role of perception in the process discussed, a structural pattern comparing the above-mentioned factors and variables with common constituent elements in formal patterns,

that is, components, syntax, and meaning could be presented. In this equation, the physical factors of the environment are considered as components in the model. The physical environment as an independent variable of the above-mentioned interaction model includes two major categories: 1. Spatial features (which can have a formal or functional origin), and 2. Specific functional spaces, both are afforded at the macro scale through the form of architecture. Furthermore, the affordances of each environment are defined based on these factors, which lead to the perception and consequently behavior, as the mental stimuli. Such behavior is, in fact, a signified of environmental perception realized by the user. Therefore, behaviors and observable behavioral characteristics in an environment can be introduced as the dynamic governing syntax and a structuring factor of environmental components. Consequently, the environmental meaning and the sense perceived by and created for the user is also defined as the meaning of the syntax effect on the components. Obviously, the correlation between the variable of meaning with the intervening variable of perception in different persons leads to significant changes to it. Therefore, the reverse use of the output of the model presented in Fig.1 to predict optimal relationships and, of course, to establish the correct types of them, will result in a meaning that is expected to be reproduced relatively. Describing that the intervening role of perception based on individual characteristics has a significant effect on the user's general mood, so its positive aspect leads to cognitive flexibility and the actualization of a higher level of the sense of place, while its negative side causes disgust towards the environment. This equation of the mentioned factors with the various elements of a structure generating pattern led to the formation of the main theory extracted from the theoretical framework of the research, the corresponding model of which is depicted in Fig.2.

Research findings

Based on the developed framework to answer

the research question, the results of the related literature review and grounded theory were categorized and encoded in three categories, including spatial features, functional spaces and, environmental affordances. Then the data obtained from the semi-structured interviews were arranged

in these three categories and their frequency was measured. Therefore, the items that appeared in the form of repetition and, in other words, resulted in the saturation of the information, were considered as the criterion for the final interpretative analysis of the researchers (constructivist effort). The

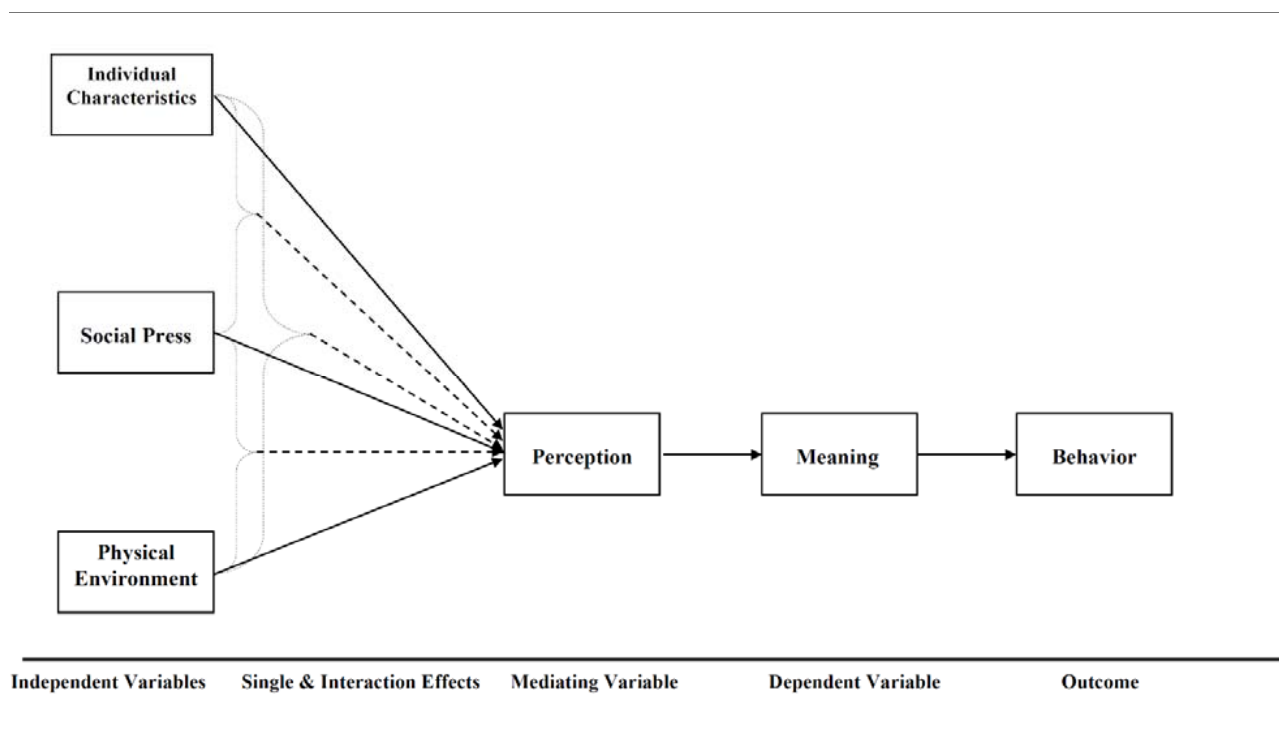


Fig. 1. Model of the actualization of behavior based on the environmental interactive effects. Source: Authors.

grounded analyses conducted in this research in the form of semi-structured interviews followed by detailed documentary studies did not change the macro scale, or in other words, the framework of the review of theoretical foundations, and only contributed to enrich, complete, and evaluate the data obtained and explain the details of physical factors that somewhat had previously been addressed in similar past researches. The completion and clarification of the data from interviews, especially in relation to the item of spatial features, is obvious. Some of these features that emphasize the formation of meaning and the perception of the environment are: natural light, openness and

extension of space, visual accessibility and direct line of sight, appropriate sound levels, privacy and lack of congestion, the need for personal space and territory, semiotics and symbolism, color, texture, reflection, etc., which mainly refer to the requirements for satisfying the needs of environmental convenience. Furthermore, the data obtained about environmental affordances resulted in the saturation of items such as memorability and memory-making, presence-ability, discoverability, being dominated and also being sanctimonious, and so on. With regard to the emergence of environmental affordances from spatial features and functional spaces and consequently the correlation

between some of these factors, it was attempted to derive these relationships using a comparative-interpretive method presented in Table 4.

It is worth noting that the mechanism of action in the proposed process was fully acknowledged by all interviewees. Explaining that the specific spatial features and some functional spaces create the environmental affordances and the user is stimulated mentally in the face of these

affordances and a particular motivation is triggered in him to meet his needs at different levels. This motivation varies according to the various abilities and competencies of individuals; in other words, their relative perception of environmental affordances varies and leads to different behaviors in the environment. Accordingly, and based on the psychological aspects, a structural pattern was finally suggested explaining the process by which the

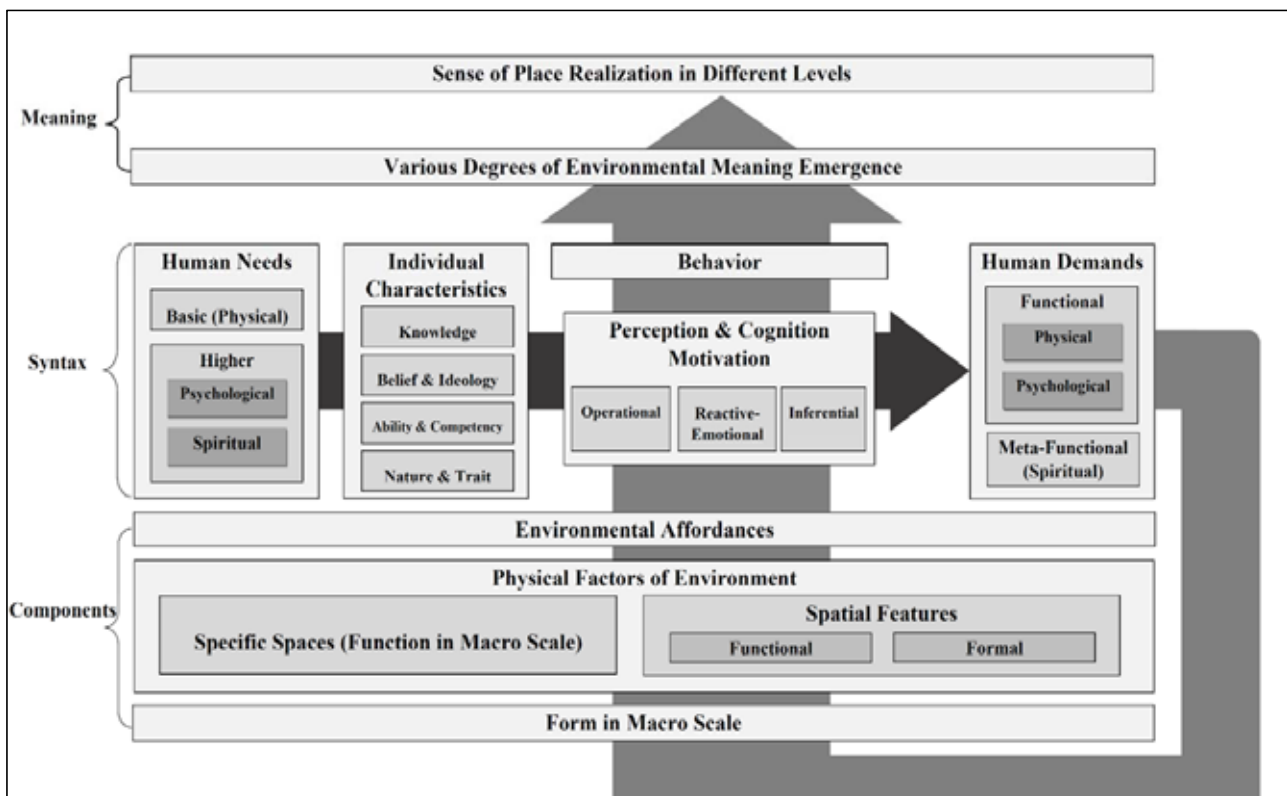


Fig. 2. The conceptual model of the research based on the pattern explaining the psychological process of achieving environmental meaning. Source: Authors.

environment becomes meaningful from the user’s point of view. This pattern is beyond a classified description and has a distinct feature similar to any other structural pattern, i.e. generativity. Describing that one can use this structural system in the form of “if-then” principles: if the condition “A” is realized, then the event “b” occurs. In other words, in the context of an environmental pattern, if “a certain behavior or behavioral characteristic

emerges by one of the users of the environment”, then “a particular physical environment with its own unique qualities is required for that user to become meaningful”. Therefore, it can be admitted that based on this pattern, the targeted evaluation of existing environments would be possible, and the application of the resulting guidelines in a predictive and reverse approach will be useful in designing new environments.

Table 4. Environmental affordances affecting the attainment of the meaning and actualization of the sense of place in corresponding to the underlying spatial features and functional spaces. Source: Authors.

No.	Environmental affordances	Underlying causative spatial features	Underlying causative functional spaces
1	Memorability and Memory-Making	Formal signification and symbolism - Formal legibility and clarity - Privacy and territory - Functional diversity - Spatial proximity	Spaces with proper natural views and sight - Collective spaces - unofficial spaces – Mediate semi-open spaces
2	Possibility of personalization and Being dominated	Functional flexibility and collaborative design - Privacy and territory - Appropriate zoning and hierarchy - Stability and balance – Supervise ability - Functional discipline	Individual and personal spaces - Appropriate access spaces
3	Presence-ability	Appropriate zoning and hierarchy - Safety - Functional discipline - Visual proportions - Transparency and visual accessibility - Spatial extent and openness - Lighting and penumbra - Natural light and ventilation - Formal integrity and cohesion - Formal signification and symbolism	unofficial spaces - welfare spaces - Multipurpose spaces – Green spaces – Halt spaces
4	Activity-ability	Functional flexibility and collaborative design - Functional diversity - Functional mixture, integrity, and cohesion - Specific texture and color - Appropriate zoning and hierarchy - Interconnection of inside and outside	Multipurpose spaces - Appropriate access spaces – Mediate semi-open spaces
5	Discoverability	Spatial interactionism - Natural Materials and elements - Formal and functional encoding - Lighting and penumbra - Contradiction, contrast, and deconstruction - Permeability and movement continuity	Spaces with proper natural views and sight - Green spaces - walkways
6	Collectability	Spatial extent and openness - Functional proportions - Safety - Natural light and ventilation - Space proximity	Collective spaces - Multipurpose spaces - Green spaces
7	Being Sanctimonious	Lighting and penumbra - Spatial extent and openness - Formal signification and symbolism - Functional discipline - Specific texture and color - Interconnection of inside and outside - Natural materials and elements	Worship spaces - Halt spaces – Mediate semi-open spaces
8	Changeability and adaptability	Functional mixture, integrity, and cohesion - Complexity and semantic ambiguity of the form - Functional flexibility and collaborative design - Spatial extent and functional proportions - interconnection of inside and outside	Multipurpose spaces – Mediate semi-open spaces
9	Interpretability and philosophic-acceptability	Formal integrity and cohesion – Contradiction, contrast, and deconstruction - Formal discipline and chaos – Formal signification and symbolism - Privacy and territory - Functional flexibility and collaborative design	Mediate semi-open spaces – walkways - Halt spaces

**Discussion**

Numerous recent studies in the fields of architecture and environmental psychology have focused on the subject of the formation of the

environmental meaning and the actualization of the sense of place, identifying and classifying the effective factors and subsequently introducing the benefits of obtaining it at a high level (especially

the place attachment). In this regard, it should be mentioned the considerably wide researches by Gifford (2010, 2014, 2017), which were discussed in previous sections. An obvious distinction between the present research and those studies is its comprehensive consideration centralized on the mechanism of the action in the examined process, for which a systemic prototypical approach was utilized to explain perfectly. Accordingly, it can be claimed that this attitude led to the totality, integrity, and structuredness in the results, that is not prominent in none of the past researches. Explaining that the mentioned systematic view in the research method and data analysis and also the presentation of the applicable results in order to introduce and classify the physical factors in detail, causes that the operational findings have a considerable degree of comprehensiveness in comparison with past researches, in addition to propose a generative pattern explaining the mechanism of the mental formation of the environmental meaning and the actualization of a sense of place in a possible level of occurrence. It should be noted that many researches in this area have focused on the impact of a specific physical environment or some of its features on a particular behavior or special behavioral characteristics, which in the most of them the significance of that relationship is confirmed. Therefore, it is possible to validate the research theory that considers the role of the environmental behavior as a key indicator (organizing and structural system) to conduct the environmental design. That is mean by observing and reviewing it, a designer can use a reverse engineering approach to achieve the optimum design strategy and suggest his ideas accordingly. It is uncovered that attention to the organization of components in such structural pattern has a significant role in its applicability and effectiveness in real worlds. Therefore, the purpose of this research, unlike similar past researches, was not limited to the presentation of effective spatial components or features, but worked beyond it.

Furthermore, another important distinctive aspect of the research is about considering the exclusive meaning resulted from a particular syntax, in contrast to many previous structural patterns focused on the exclusive meaning of a particular syntax. This is quite contrary to the belief of Chomsky and his followers that introduce their grammatical rules as syntax-oriented and ignore semantic factors. As stated, Chomsky posits that the mere presence of syntax results in meaning, while the definition of syntax in the proposed pattern of the present research involves the evaluation of semantic factors and derivatives such as behavior and emphasizes their relationship. This is contrary to past researches that have largely distinguished behavioral and semantic indicators.

### Conclusion

In the light of the research that has been carried out in the past to compare the structural processes of environmental design with the grammars in linguistic and non- linguistic areas, This study aimed at providing a general psychological pattern that can correctly explain the structural process of achieving the environmental meaning and actualizing the sense of place from the channel of the architectural design process. Therefore, it considers this process in total with a systematic approach. In this regard, attempts were made to describe, explore, and ultimately present the theory using a qualitative methodology of a survey titled "Constructivist Grounded Theory". The results of the research led to the presentation of a vast range of physical factors in the form of spatial features and, of course, specific functional spaces that cause forming environmental affordances and thereby motivating users and their different behaviors. To answer to the research question, comparison and summarization of the findings from the literature review and the analysis of research-performed interviews result in some of the most important environmental properties and affordances and prediction of their correlation



in the form of a process-based pattern. The basis of the proposed model is based on the range of changes in the emergence of the environmental meaning and, consequently, the actualization of a sense of place that is proportional to the mediation of the intervening variable of perception and the mechanism of the human mind. Expanding that the potential environmental affordances create the context for the formation of the meaning and a relative level of the sense of place through the filter of individual perception (influenced by individual characteristics). Therefore, with regard to the individual's perceptual power and subsequently his motivational response to environmental affordances in order to satisfy his needs and desires, one's behavior is manifested. It is worth noting that the subject of individual perception was especially considered in defining human demands and desires based on the basic and higher needs. Thus, the intervening role of individual perception, cognition, and motivation, as a pivotal common element in both paths of the suggested process (1. The transition from the need to demand and the formation of individual desires based on needs; and 2. The transition from the environmental affordances to the user's behavior and inference of environmental meaning accordingly) is considered as the most important factor in the multiplicity of degrees in the occurrence of states, emotions, positions, and subsequently, behavior. It should also be noted that the proposed pattern, similar to other structural patterns in linguistics and non-linguistic areas, includes three main elements of components, syntax, and meaning which are matched, respectively, with physical factors, environmental behavior, and environmental meaning and sense of place. In the end, it could be concluded that based on such a pattern, the concise evaluation and interpretation of the existing environments would be facilitated on different scales and significant results could be obtained in the design of new environments with a reverse approach to the pattern and application of the

guidelines attained.

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