



Metaphorical Reasoning in Architectural Design and Construction

Sajad Aeini¹, Khosrow Afzalian^{2*}, Iraj Etessam³, Farhad Shariatrad⁴

1. Ph.D. Candidate, Department of Architecture, Mashhad Branch, Islamic Azad University, Mashhad, Iran.

2. Department of Architecture, Mashhad Branch, Islamic Azad University, Mashhad, Iran.

3. Professor, Department of Architecture, Research Sciences Branch, Islamic Azad University, Tehran, Iran.

4. Assistant Professor of Architecture, Shahid Beheshti University, Tehran, Iran.

Submit Date: 18 September 2022, Accepted Date: 23 January 2023

ABSTRACT

In process research studies, researchers often face a convergent image due to confrontation with a subjective thing. To move out of this converging situation, the researcher will attempt to discover and develop the logic prevailing in this situation. For this, the goal is to discover the order embedded within these process concepts. Consistent with three commonly recognized reasoning methods of inference, induction and analogy, the present study seeks to outline metaphor as a reasoning method as an extension of analogy, mainly aiming to understand its internal structure and mechanisms. At first, in the research methodology, analogical method has been used to understand inner structure of any of three respective methods. Then, in the second phase, the structure of analogy and its status in design process was investigated by the lens of inferencing reasoning. And, development of analogy cased to study the differentiate of metaphor and analogy in the third stage and applies library sources to gather data. to elaborate on the construction of metaphors, its process status in both domains of creation and reading of the text is first taken into account, and its internal construction is examined by providing a four-stage mechanism including Extraction of unknown concept, conceptual/metaphorical relation and problem, Translation and application of structural similarities and creation metaphor. The artwork complexity, the formation of figurative languages and binary meaning in the reading of the work are birth from the structure of the metaphor, which originates from the removal of a part of the pillars of analogy.

Keywords: *Deduction, Metaphor, Reasoning, Design Process*

1. Introduction

The subjective nature of the design process creates diversity and a less-developed understanding of the process. For this, design domain researchers have accurately mentioned the certain process stages of the creation of form and space [1]. A product of architectural design as space is evidence of the process and method of problem-solving in it.

For some process researchers, a process of this kind can be explored, like problem-solving in sciences [2]².

To Lawson, design refers to a manner of thinking, one that has its specific mechanisms [3]. The significance of promoting the manner of viewing design is such that it makes the subject of designers' manner of thinking and their subjective

* Corresponding author: Dr. [Khosrow Afzalian E-mail: khosrow.afzalian@gmail.com](mailto:khosrow.afzalian@gmail.com)

This article is an excerpt from Doctoral dissertation by Sajad Aeini entitled "Methodology of second-generation design processes of post-revolution architects" under supervision of Dr. Khosrow Afzalian and Dr. Iraj E'tesam and advisement of Dr. Farhad Shariatrad at the Islamic Azad University of Mashhad

² Design thinking has been part of the collective consciousness of design scholars since Rowe stated it in his book. In the second DTRS symposium, the creation of a multifaceted understanding of design thinking based on the broad differences of design situations and the application of theories and models of methodology, psychology and education during twenty years of research was considered. Research enriched the understanding of this complex human reality, but later, design thinking became a paradigm to face the problem in many professions. The desire to apply design thinking led to a sudden demand for defined knowledge in the field of design thinking. This issue was considered a challenge for design researchers who were ashamed of simplicity in design thinking and valued a multifaceted viewpoint and a rich image.



mechanisms worthy of study without past assumptions.

Design thinking should be viewed as a type of non-verbal thinking which is less attended to. Most of our experiences come from thinking of verbal type. Verbal thinking is used during the time of conscious communication [4]. When designing, architects are consistently faced with a kind of non-verbal logic. One can thus witness the architect's significant effect on the design process due to his/her role in this kind of thinking [4]. Over the centuries, and due to the dominance of verbal thinking, non-verbal thinking was ignored. On the other hand, the use of terminology for the manner of thinking that is not founded on the terms is difficult. This conflict, though seemingly contradictory at first glance, will not be impossible. Numerous contemporary theories posit stages of process and patterns of movement in the processes. These processes are characterized by a two-part basic and primary pattern which is founded on "analysis" and "combination." The appearance of process research, together with the methodology of design, is multiple. These multiple appearances, if studied without regard for the reasoning logic of the methods, will be interpreted as diversity.

Each thought is represented by means of reasoning manners it is founded on. On the one hand, no thinking will take a step without the application of logical reasoning to substantiate or reject their parallel thinking. In essence, part of the substantial qualities of the processes and their development involves limitations imposed from the employment of reasoning methodologies over the processes. Due to the diversity of the classifications provided by contemporary methodologists over the past decades and the absence of common ground between them, it is sometimes difficult to outline a coherent image of the subject totality. What is regarded as process research is, in fact, founded on a logical manner in design which is represented in various processes and methods? Logical reasoning, which is the logical cornerstone of design processes, can be regarded as a consolidating component of the methods that would help them become more systematic. Understanding the design process depends on the understanding of the reasoning logic which underlies the processes. The present study seeks developing reasoning logic in the design process to introduce metaphor as a reasoning method within the design process, logic

as an extension of analogy and to discover the metaphor mechanisms as a reasoning method in the work.

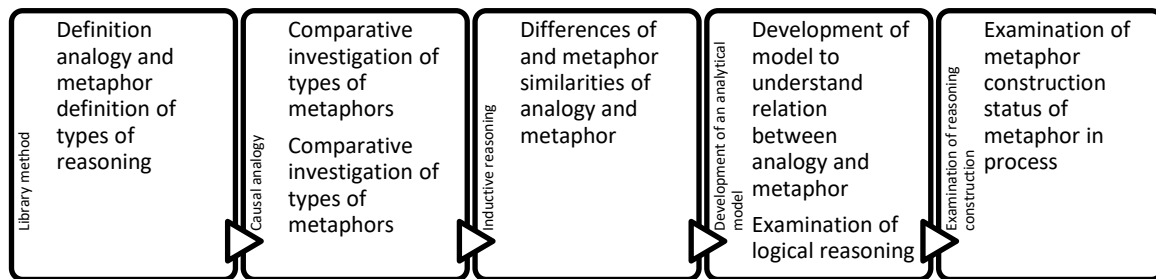
These classifications extend to a reasoning manner that underlies the formation of design thinking. This research attempts not only to understand the metaphor mechanism as a reasoning method but also to delve into the effects of the metaphor as a reasoning method to create originality in architectural work. The goal of the research was to achieve an internal domain of metaphors and mechanisms used to create it within design thinking and to understand metaphor as a logical manner in design. Fewer studies have examined the relationship between the design process and the logic of reasonings governing architectural thinking. In most cases, researchers have sought to develop boundaries of the discipline, though failing to understand the logic prevailing on the central core of the processes. It appears that the absence of such research can affect the non-formation of the developed image of the process of research.

2. Research Questions

- What is the construction of metaphor as logical reasoning in design?
- What are the effects of the metaphor as a reasoning method in the creation of originality in an architectural work?

3. Methodology

Considering the nature of the present research, the researcher faces a subjective affair, as the way the researcher deals with the subject is the effect of his/her knowledge of that subject. This research is cognition-based research that falls under qualitative research. The method under study here is a "causal-analogical" and "inductive-interpretive" study. Thus, the research approach is a mix of inference and induction; In the inference section, the research reviews the literature to identify and analyze manners of reasoning. Then, the way logical reasoning is employed is addressed. In the next stage, the research comes to an understanding of the metaphor as a reasoning method and unveils the usages of the method as a design logic and its functioning. To gather data, the researchers study library sources in the first stage and then conduct a logical analysis of the data. Later, the general research structure is outlined based on the research steps and methodology.

Figure 1: Diagram of research steps based on methodology (source: authors)

4. Research Limitations

Each research is a product of a series of limitations that may affect the quality of the relevant results. In principle, the present research is no exception and involves limitations. Some of these limiting factors are internal limitations that result from the subject of this study and affect the research trend disregarding time and place and the researchers. Some others are external factors that may change in line with the content of the study. To better understand the research process, it is critical to briefly elaborate on some of these factors.

4.1. Internal limitations

Reasoning logic is basically a subjective and internal concept that has no objective counterpart. Even if it is possible to have a reading of a reasoning logic, the possibility of determining the boundaries at each section and differentiating them is difficult. This will give the researcher the opportunity of various readings. Although this can lead to an opportunity for the development of a discourse in the study and help create new readings of the reasoning logic, the measurement and evaluation of a subjective affair, influenced by different readings, will, eventually, be subjected to analysis. The second limitation is the fluidity and inconsistency of the subject. Due to the nature of the subject falling under the thinking category, the researcher will naturally confront a fluid subject during the study, and thus, what the previous researchers or interviewees spoke of can be dynamically and continuously changed and affected by various factors. Meanwhile, it should be borne in mind that for a study of this kind, the researcher must momentarily choose from an amorphous and fluid process and repeat and report them so that s/he will be made aware of the reasoning logic development. This manner of study, although it may lead to the loss of parts of the data, is the most effective and inclusive manner for the study of subjective concepts.

The process being amorphous means what occurs as a result of process research and what systematizes the processes will be greatly

influenced by the researcher's perception of the process; for this, when registering the configuration of an event or a phenomenon, two researchers may have differences over registering the steps. This is evidenced by different readings of a design subject and various narrations of a design procedure. In fact, in designing, the researcher will face a kind of interpretability.

Another major limitation pertains to a lack of self-consciousness. Lack of self-consciousness refers to a status that the researcher and the interviewee may have when dealing with a section or a step. This could also cause disruption to the process and render it defective. For this, part of the consciousnesses may be out of access due to the lack of the interviewees' self-consciousness as regards the processes and manners of performance.

4.2. External Limitations

Another challenge is the cognition-based nature of the research, as the inaccessibility of the research subject and its subjective nature for the researcher will bring about necessities for the research. A situation of this kind will lead to a cognition of the research subject. Another subject refers to the study of a process governing a system by the system itself. In fact, what is deemed important by the design researcher and the designer of the process research activity is the attempt to delve into the mental performance of the mind itself. The use of the mind as a tool to study it serves as a challenging situational subject; a situation of this kind can lead to cognitive errors, also. In fact, considering the knowledge of the mind, parts of the process may remain in the back of the mind and remain out of access.

5. Literature Review

5.1. Design logic

To achieve logic in design thinking, an analytical approach can be used to discard the complicated and intriguing description of the design, and a conceptual framework can be developed instead. Types of logical reasoning constitute the essence of design [5]. For this, it is imperative to elaborate on three macro methodologies of logical reasoning,

namely inference, induction and analogy, as methods underlying the reasoning behind the formation of a dialogue basis. The basic reasoning patterns were described by Rozenburg through a comparative equation that included the known and the unknown, developed by Peirce. To outline such an equation, it is critical to reveal the construction of a logical reasoning basis that results from the combination of “what” and “how,” which seem to have found the reasoning patterns. In inferential reasoning, the “what” and “players” required by the situation intended are focused attention. As well, there is the consciousness of the “how” of the functioning of the players with each other. The consciousness of the players and the way they communicate together will lead to the predictability of the results. Induction refers to the knowledge of “what thing” or “in which situation” and the observation of the result, as nobody knows how laws prevail over these movements. Induction is the generalization of realities beyond their mere concepts.

Induction is a document evidencing the way its execution is generalized [5]. This indicates two points: first, induction is associated with probability, and possible propositions are not as strong as necessities at all; the second indication is more widely used since it is capable of explaining a more comprehensive reality [6]. Each logical system is a balance between inferred necessities and inductive predictions. Definitive inferences are derived from a limited set of observed phenomena. These observed patterns yield a more general logical system that can be explained by some possible observed samples. This is the same inductive

feature of logical reasoning (Ibid). These two forms of analytical reasoning predict and explain every phenomenon that is in the world. The last stage of logical reasoning is the analogy. In analogy, “what” is uncertain, and in some cases, “how” is also uncertain, in addition to “what.” For this, trial and error procedure are used to test various “things” and “methods (how)” to achieve an intended value and to reform and develop things and how. Dorst maintains that from among the three methods mentioned above, “analogy” is a basic reasoning pattern in the design because the designer uses trial and error to provide suggestions about the “things” and “how,” then, by considering his/her desired results, evaluates and modifies the things and how within the feedback and corrective processes. This process continues until an appropriate response is provided for the problems and the conflict from the sub-problems is settled

[7]. The analogy appears in two forms, characterized by a value the designer intends to achieve.

The first form of analogy is also associated with problem-solving and helps designers to attain the knowledge of “how” and “working principles” deemed necessary for the achievement of targeted values; however, “what” is still a matter of question. It is a logical process in that designers execute a scenario to create a “thing” within a working process. In its second form of analogy, only is there the final value in the circle of consciousness is to be achieved. Thus, because the principle for the designers is not the recognized or selected design thing to pave the way towards the values, understanding “what thing” will be challenging; this denotes the establishment of “working principles” via a thinking manner that approaches induction, and one “thing” (thing, services and system) via thinking manner that approaches to analogical reasoning. This includes the development of a new “frame” [5],[8].

Creation of a complicated creative set of one thing (thing, services and system) and working in parallel with it is mostly a cornerstone of design thinking. This creative stage obliges the designer to provide a proposal for “what” and “how” and testing [3]. The strategy of production of the proposal for the solution, analysis, evaluation and promotion will continue until they are found to be satisfactory. This is one of the key components of the design [5]. This will form design professions and majors as thinking-based professions while being distinct from analysis-based (inferential and inductive) and problem-solving (analogical) professions. These two issues cannot be differentiated clearly, as the design is not merely a reasoning manner; but rather a combination of types of thinking concentrated over the solution (analogy), which includes problem-solving and a kind of design that involves representation in an evolutionary process [5].

5.2. Analogy; the Basis of the Design Logic Metaphor as the Extension of Analogy:

Analogical thinking is a powerful machine with cognitive functions. Quoting Denise Scott, Lawson reminds us that analogy has always existed in the thinking structure [9],[3]. Analogy denotes similarity or sameness of the conveyance of the principles, concepts and characteristics of the source to the target. In the psychology of problem-solving, thinking based on similarity and sameness is a basic measure of problem-solving. Many design research experts hold that designers rely on analogical-based thinking as the most

common logical method to provide architectural schemas [4].

Metaphor denotes borrowing a term for another one, as defined by the Persian Dictionary [10]. By metaphor, it is meant a set of linguistic processes where attributes are “transferred” from one “thing” or “object” to another thing” or “object.” This transfer takes on a form as if the second “object” is the first “object.” Metaphors have different variants, and the number of “objects” or “things” involved in them varies. The general “transfer” trend is, however, the same. Metaphors are the main figurative forms of language. A figurative language refers to a language that creates a distance between what it intends to say and what it actually says. A language of this kind has mainly a descriptive nature, with the transfers taking place in it leading to something represented as an “image” [11]. In its traditional sense, a metaphor is a compressed similarity that is aimed at transferring meaning [12].

It was Aristotle who, for the first time, used a metaphor based on simile and as a compressed simile. The Theory of Simile that represents the views of the Classic School advocates suggests that shared characteristics between two compared things did exist prior to the construction of the metaphor, as a metaphor can be regarded as the transference of a cognitive theme without

elimination of the concepts. From a classic point of view, metaphor is more of a literary technique. Contemporary literary experts like Shamisa have enumerated a special type of figurative speech, i.e., “interest in similarity,” to be “metaphor” as the only conventional figurative part of the literature [13].

In the interactive perspective, metaphor, as the first modern theory, has two fundamental claims: first, metaphors involve inseparable cognitive content, and second, the cognitive content (meaning) is produced through different cognitive systems [10]. In fact, metaphor allows a kind of experience to be perceived in another format by raising a kind of sameness between two phenomena, which cannot be naturally thought of as the same [13]. In their books “Semantics” and “Language,” linguists Yerall and Bloomfield have described metaphor as the most important factor of change to the meaning. Others such as Olman, Agden, Richards and Jacobson, as well as Lacan and Derrida, have also defined metaphors as the game of the signifiers. Lakov and Johnson also have a major role in metaphorical studies by raising conceptual metaphors in this regard [13].

Lakov and Johnson maintain that metaphors not only increase our understanding of thoughts but also, in a practical stage, form the human’s structure of the perceptions and intuitions outside

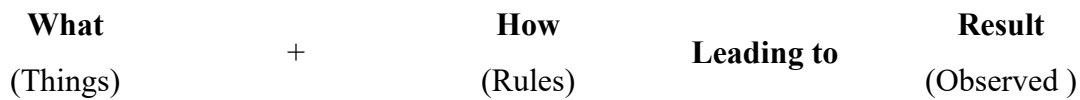


Image 3: Basic patterns of a logical reasoning construction (Source: Dorst, 2010).



Image 4: Construction pattern of logical reasoning of inference (Source: Dorst, 2010).

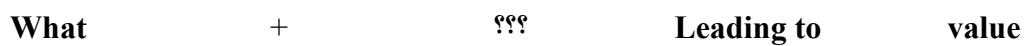


Image 5: Construction pattern of logical reasoning of induction (Source: Dorst, 2010).

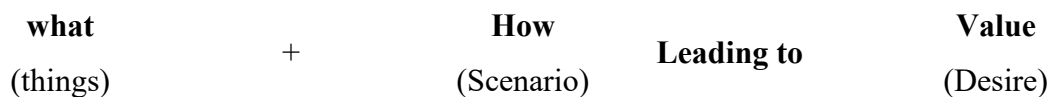


Image 6: Construction pattern of logical reasoning of analogy (Source: Dorst, 2010).



Image7: First construction pattern of logical reasoning of analogy (Source: Dorst, 2010).

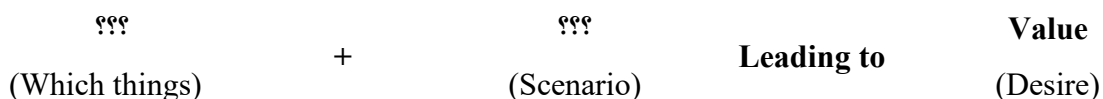


Image 8: Second construction pattern of logical reasoning of analogy (Source: Dorst, 2010).

Table 1: Comparison of classification by Leduc and Antoniadis (Source: authors)

| Usage of metaphor | Quality of usage |
|--|---|
| Motivational | Metaphors create excitations and motivation in the user's mind by decorating and foregrounding the text and subject matter and by strongly processing the meaning, thus driving the user's motivations. |
| explorative | Metaphors reveal some of the indescribable experiences and concepts and objectify abstract and intangible things. This is a two-part discovery both in the speaker and in the user. |
| Interpretation | Understanding abstract and intangible concepts by means of objective concepts and delving into the inward through the outward. |
| cognitive | Metaphors activate the inclusive existence, especially emotional movement-mental and cognitive domains of the human being in relationship with each other and achieve cognition, thus getting help from interdisciplinary research to solve the problems. |
| Creation and expansion of meaning | Metaphors expand meaning by transferring meaning from one domain to another; here, imagination does not mean the reconstruction of an absent thing; but rather denotes the creation of a thing. |
| Emphasis on meaning and foregrounding | Metaphors foreground special meanings and intent so that the user finds the designer's intent more fully and clearly because it helps draw attention. |
| ambiguity | Metaphors motivate the mind by exploration and interpretation and express some unconventional concepts which cannot explicitly be expressed under special conditions. |

the world. The daily conceptual system has a basically metaphorical nature. Lakov and Johnson's approach was called "Contemporary Metaphor Theory." For Max Black, the contemporary philosopher, making metaphors is a mentally distinct practice. Metaphors do not express pre-existing similarities between two things; rather, they create similarities. For Black, metaphors not only help us recognize reality, but they also create a new meaning or reality; in a word, metaphors make concepts [10]. As noted, a priori reading of metaphors is mostly aimed at the literary function of metaphors and falls under classic discourses while promoting the contemporary metaphorical approaches to the level of reasoning with cognitive functions [13].

5.3. Types of Metaphors

The presence of a spectrum of analogies under design situations has led to the creation of multiplicity in the path of problem-solving. Metaphors begin at a stage of intuition beyond simile and can be regarded as a sign of the mind being freed from the bondage of the words and the unconscious meaning path. The origin of metaphor theorization should be sought in literature. As regards the theories, three prevailing discourses of "classic," "romantic," and the dominating paradigm of the twentieth century can be explored. As the most prominent theorist of the classic school, Aristotle defines metaphor to be separation from "conventional forms of language," arguing that there is a metaphorically-originated difference

between the "conventional" usage of the words and their "poetic" usage [14].

The romantic perspective, influenced by Plato's views, emphasizes the unifying role of metaphor and considers it as a link to mental activities. The classic approach views metaphor as merely decorative speech, which is language and literature specific. As the cognitive school was introduced, the contemporary approach changed. Consistent with contemporary theory, metaphors do exist in both practice and thinking continuously. In literature, metaphors include two near or far variants from a conceptual perspective. Cognitively speaking, metaphors also include four visual schemata such as space, volume, movement and power metaphors [10]. In the twentieth century, metaphors were recognized as a kind of "linguistic process" that included the interaction of tenor/topic and vehicle. The result of this process was to create a meaning that not only covered both terms but also went beyond them to replace them. This interaction entails each term/word having a different semantic layer because if each and every term has a meaning, it cannot be replaced with another one. This quality helps enrich the metaphorical process. Consistent with the latest perspective, metaphors are beyond their lexical meanings, which are a kind of "transfer" or "one-sided" relation, which are explained by interaction or "two-sided" relation," thus leading to a new meaning and includes different layers [14]. Lakov and Johnson state that a major part of our

conceptual system is constructed by metaphorical relations [15]. The use of ironies, metaphors, similes, allegories and symbols are the best and most appropriate ways to convey the concepts [16]. Tables 1 and 2 give views of metaphor experts. As evident from the comparison of views by Leduc and D. Berggren, the former's classification is mainly directed at architecture and its objective consideration, while Antoniadis bases his classification on metaphor, though reemphasizing the output of the metaphors. He also pays attention to the process aspect and considers it to be the origin of the creation of a work. It appears that Leduc's classification pertains to the methodologists who, in their works, attempt to explore the concrete works in their studies. At the same time, paying attention to metaphor and its role in the process and source of the problem leads to the development of literature. From another point of view, several functions are known for metaphor. In research titled "Effect of Metaphor in Increasing Students' Creativity in Architectural Design Education," Manijeh Ghorbani (2017) introduced the category of metaphor based on its functions.

6. Discussion

In order to advance the discussion, an effort was made to design a mechanism in the discussion in order to address all the structural features of analogy and metaphor. Therefore, in the first step, by comparing the characteristics of both, their commonalities and differences were examined in terms of reasoning possibilities. Then, the status of these two reasoning methods in the design process was analyzed. In the next step, an attempt was made to study the internal mechanism of each of these two methods, and finally, the effect of each in the representation of the work was considered.

6.1. Characteristics of Analogy and Metaphor

Metaphors have extended their meanings over time and turned into a way of thinking. Hemmatyar et al. (2015) have interpreted metaphor to be a variant of the thinking process which produces new meanings for ideas and events. Analogy and metaphor have both a process origin, being used in the face of a cognitive domain. In his/her mind, the designer finds a similarity between the current issue and the previous ones, thus, establishing an objective relationship (analogy) to associate the previous solution with the new problem. The other

Table 2: Classification of metaphors based on functions (Source: Ghorbani, 2018).

| Thinker | Types | Definition |
|-------------|---------------------|--|
| Antoniadis | Non-concrete | It arises when the early origin of the creation of the work has been a kind of concept, idea, human state or quality, such as individuality, naturality, generality, tradition or culture. |
| | Concrete | It arises when the early origin of the creation of the work has been some of the visual or material characteristics |
| | Combined | It is what includes both of the above two states. In this metaphor, the visual-material characteristic is a pretext for the revelation of superiorities and qualities in visual form. |
| Leduc | Machine | Qualities with an abstract structure/transparency-semi-transparency, as well as geometric structure against mass and non-transparent structure |
| | Embodied | Design or industrial materials processed and based on technological methods |
| | Crystal | It is based on organic geometries, not merely limited to humans. |
| D. Berggren | Visual | It refers to the direct semantic association between various visual images which involve both concrete elements and feelings, i.e., it is placed between two ends of a spectrum. Thus, three variants appear in the form of rational poetic and visual sentiments. |
| | Contextual metaphor | It is based on sensual intuition and similarities and differences between the ideas, usually involving the indirect meaning association of subjective images expressed by words. |
| | Structural metaphor | It includes abstract communication by means of analogy between the structures, thus standing on the rational-bound end side of the spectrum. |

state involves a kind of transfer from one subject to another using imagination. In this case, there is an abstract relation that expresses metaphor. It is thus imperative to discuss the relationship between analogy as a basic logical form and metaphor. Some of the propositions refer to the common construction between these two logical reasonings, with some of which emphasize the metaphor, which is an extension of metaphors. Therefore, in

the table below, the researchers tried to design a device by citing the definitions and characteristics that have been proposed for each of the analogy and metaphor and logical reasoning, in order to clarify the common and distinctive aspects of these structures. The basis of such device is to examine the commonalities and differences between the two reasoning methods.

| | Title | Description | analogy | metaphor |
|---------------|--------------------------------------|---|---------|----------|
| Common points | Process status | Most of the studies about analogy and metaphor direct their attention to architectural work, aiming to delve into the architectural context to extract an objective subject. Metaphors, as a logical possibility, play a process role in the configuration of the problem and cognition domain. | * | * |
| | Common construction | The analogy is structured in the absence of “what” or the concomitant absence of “what” and “how” [5]. What outlines metaphor as an extension of analogy is the construction it shares with the analogy. With the removal of part of the analogy that leads to the greater complexity of reasoning, the common aspect of the two logics will be “how,” though the discovery of its what will be borne on the metaphor user. In metaphor, the user confronts a kind of meaning, expansion or contraction. When “what” is removed from the analogy, the phenomenon gets smaller, and the metaphorical configuration will be contacted. When reading metaphors and considering their subjective nature and their meaningful concept, the user will face a kind of extension. | * | * |
| | reasoning functions | The designer’s cognition of the problem is the prerequisite to the problem solution [1]. Metaphor, while being considered as a kind of analogy in the problem configuration, affects the systematization of the mind or establishment of corresponding familiar concepts and creation of an opportunity for the discovery and development of a subject, thus adding the logical richness of the reasoning manner. | * | * |
| | Conceptual structure | Metaphorical planning is a basic instrument for the conceptual structure, which serves as a powerful strategy for giving meaning to architectural works. A metaphor is a kind of meaning extension that serves as a messaging tool and is subjected to formative and content developments. For this, metaphor is a form of analogy that takes the meaning in the structure [16]. | * | * |
| | cognitive instrument | Lakov and Johnson maintain that spatial experiences have roots in metaphorical structure. Metaphor is not a simple linguistic form of a word used for artistic and eloquent purposes; rather, it is a process of main cognitions by which it fulfills valuable experience and gives meaning to it. In this sense, metaphor is an experiential process concept of the analogical type, which is an extension of analogy, with which a domain of experiences is perceived and planned in another domain of experiences. | * | * |
| | interaction relation/ meaning | The creative understanding of the problem of the metaphor in the formation of metaphor communicates with its own origin, i.e., literature with “speech.” For this, the listener should contemplate the speaker’s words to explore the truth via similarity or virtual meaning. This places the user in a two-part relation to discover the truth itself in a cognitive domain. This will help create and develop the concept, as it promotes the reasoning logic of the user and his/her understanding of the work; metaphor gives a “meaning” to an architectural work that includes different layers, thus raising the work from its ordinary level. | * | * |
| differenced | interaction of the user in metaphors | In metaphors, the “true” level, or the lexicological level of “things,” is avoided. Metaphor reveals the relation between two “things” as a virtual form other than a real form. In contrast, in simile (analogy), “things” are used in their real senses; i.e., the description of two phenomena is what comes from the “things” and gets the user faced with a finished affair where sensual effects are often the final test of the measurement of the simile success [13]. The incompleteness of metaphors against analogy renders part of the meaning to be the product of the user’s reading of the work. This is what is interpreted as the interpretability of the work and the interaction of the user in metaphors. | - | * |

| | | | |
|--|---|---|---|
| logical relation of metaphor with | When a “thing” is used virtually, a kind of “imaginary link” or other “things” are expected to take form. Using this sense of link, metaphor directs the user towards its meaning aim, though not “destroying” or predetermining that aim. The simple similarity of two words does not make cause for their substitution, as the role of cognitive patterns also matters. People’s daily experiences, ethnic beliefs and nationality issues, as well as culture, form a kind of cognitive pattern, though many of which may not have an intellectual, scientific and logical basis but overshadow peoples’ intellectual and linguistic concepts. | - | * |
| heightened senses | The usage of “something” in a metaphorical form instead of another “thing” does not denote the usage of a term for another one in a different sense; rather, this choice takes shape by preserving a semantic relation of the two units; conditions which are called “heightened meaning.” Accordingly, the main meaning and metaphorical unit are active in parallel together and concurrently, as if they are integrated into each other [13]. | - | * |
| subjective nature | The construction of analogy and metaphor is differentiated by a kind of “transformation” that unfolds in a metaphorical structure. In fact, the transformative nature is a subjective metaphorical nature against the objectivity of analogy and removal of parts of the analogical structure. Dysfunction with the analogy will lead to complexity in the transfer of the concepts, thus requiring efforts to discover the sources of metaphor. | - | * |
| different output | What takes shape in analogy has mainly a development from objectivity to subjectivity and vice versa. For this, the product of an analogical process is mainly associated with a kind of explication. This is while, in metaphorical structures, the objectivity/subjectivity to objectivity and after the interaction where semantic and virtual layers are formed in a process will be embodied against the user. For this, not only will this make the user of the work interactive, but it also leads to the development of the problem in the mind of the user. | - | * |
| creation of originality in the | Metaphor, due to the meaning it creates, is effective in the achievement of “new” horizons (from the process of design to constructing it). The metaphor may largely affect the creation of “originality.” Originality is the general identity of the metaphor; especially when the substitution technique is used, the substitution of the concepts includes subjective and objective cases, status or another art[9]. In new surveys, Karaglin has found that metaphors give identity, create a sense of originality and redefine needs and goals. The purity of subjectivity against objectivity and its freedom from linguistic rules will lead to the purity of the work (Image 4). | - | * |
| Recall with images | There are two mechanisms of “recall” and “image” for the retrieval of the image in the design. “recall” may be visual. When a problem concept in design recalls a reference form, the problem solver will benefit from its subjective visual references immediately and directly. On the other hand, visual references may be subjectivity or imagery, and the design may communicate with a concept or an image of the reference plot. In this state, it transforms its own subjective image into schemata indirectly or metaphorically [15]. Under such a situation, despite the relationship between subjective knowledge and the final plot, the designer’s creativity will also arise. | - | * |
|)The wide linguistic field of metaphor - creation of virtual language(| A metaphor is the most salient for of human cognition. Metaphor is not simply directed at linguistic terminologies because all linguistic construction has a metaphorical structure. What is introduced as a “conceptual metaphor” includes two conceptual domains where one domain is made possible by helping the other domain [13]. The conceptual metaphor concept is the most important theory of cognitive linguistics. Lakov and Johnson suggest that thinking is fundamentally metaphorical. The conceptual structure is organized through the conformity between the domains and is stored in long-term memory. Some adaptations are due to structured conceptual experiences, and others are built on the basis of experiences that form more complex conceptual structures [12] To Lakov and Johnson, the mechanism of metaphor is a contractual association between different domains. Man not only speaks with metaphorical terms but also thinks with them. For this reason, this association is called conceptual metaphor. Generally, the cognitive semantics of metaphor defines the conceptual correspondence between the target and source domains [11]. Linguistic expressions that are metaphorical in nature simply mirror the underlying conceptual associations, a subject that exists in the creation of any work of art. Metaphors reveal relationships between "things," with the difference being that these relationships are more abstract than objective. Similes and metaphors help recognize the relationship between different patterns [12]. | - | * |

| | | | | | |
|---------------------|--|---|--------|--------------|----------------|
| Quality improvement | superficiality | Present | Absent | discoverable | undiscoverable |
| | Hidden superficiality | Superficial presence of metaphorical interpretation in the plan | | " | " |
| | Transcendental expression of combined metaphor | Presence of existential superiorities | | | |
| | | Absence of superficiality of change | | " | " |
| | | Presence of existential superiority | | | |

Quality improvement

Table 3: Reasoning manner using the model of examining the logical reasoning movement from analogy to metaphor (Source: authors)

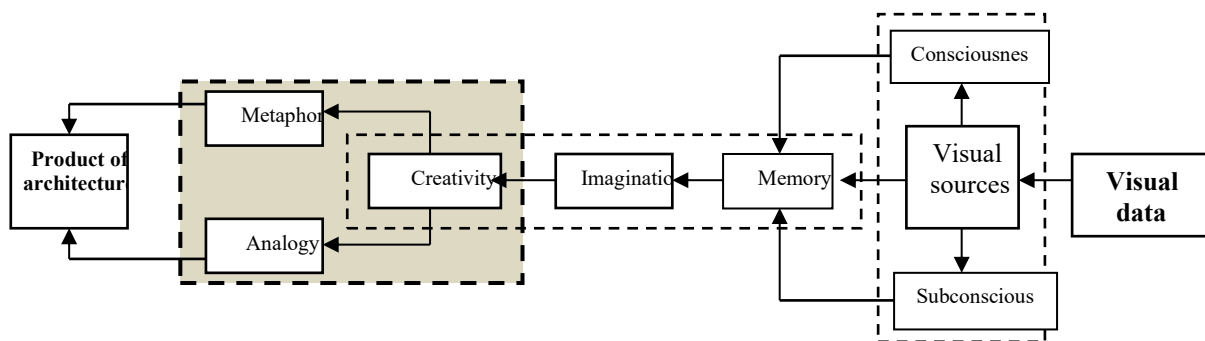


Image 9: status of metaphor and analogy in the process of creative design (Source: Azimi, 2016)

6.2. Construction of Analogy and Metaphor

This section examines the construction of the reasoning manner by examining their logical reasoning usages; the first issue is to address the reasoning manner of the process; the second issue is its internal construction and actions. The importance of addressing the analogical and metaphorical reasoning status lies with removing part of the misunderstanding in analogy exploration, which regards analogy and metaphor to mainly represent the form of a process, while these two logical methods not only develop reasoning literature but are also considered as a cognitive instrument. After explaining the status of the reasoning manner, the internal construction of these two will also be important.

6.3. Status of analogy and metaphor in the design process

Exploring the history of the process research, although providing multiple images of the process ahead of the process researchers, the direction of the logic movement in the various steps of the process should be sought in analogy. Jentner and Medina provide evidence that views thinking based on sameness to be a strong measure to solve the problem. Analogical thinking first identifies and then recovers sameness and correspondence between the potential relations in the target and relations recognized in the understanding of the new situation by relying on the similarity basis [7]. Analogical thinking, together with metaphorical

thinking configured based on similarity, has special thinking because it involves a structural relation except for the apparent features [1]. As regards the status of metaphor in the process, the critical point is that various models of different objectives define various statuses for metaphors. In total, two categories of models can be sought in the models that study metaphors; models which refer to the creation of a work (process role) and models which refer to the reading of the work (cognitive role).

According to Azimi’s model (2016), the status of analogy, after the stage of achieving data, is introduced at three conscious, subconscious and imagination levels. In another model, metaphors help develop unconventional solutions in the first stages and in the final stage of the process. Metaphor can be considered as a mediator for understanding unknown situations in known conditions; in a way, it makes it easy to recognize sources for distinguishing and understanding the unknown. The designer's mental structure is one of the factors that create unity and coherence between various factors in the design process. Thus, it is considered a prerequisite for moving towards a solution. Argumentative logic organizes the plural image of the process and affects the user’s mind to organize the problem of design and production of the theme [12].

Metaphor as a cognitive strategy establishes relations with the design issues. Metaphorical reasoning is part of a conceptual model that plays

a role in design thinking structure. Changing from a metaphorical concept to another concept makes it possible to discover new design ideas not previously noted [17].

Understanding metaphor is an individual understanding. Therefore, metaphor is always the product of mental deviation of concepts influenced by individual experience. The extent to which metaphor is related to solving the assumed problem depends on three basic stages: the first step involves the extraction of unknown concepts from various domains which are strongly related to the existing problem but are not explicit; The second step involves the outline of a plot of deep relations between the metaphorical concept and the problem; the last step is to translate and apply the structural similarities of the metaphorical source with the intended problem, which generally ends up in a new solution [18].

6.4. Analogy Mechanisms

According to a study by Khakzand et al. (2010), the analogy should be viewed as a two-part structure in two actions, with one being “identification and recovery” and the second “outlining and transfer.” The nature of the two actions should be regarded as subjective nature. These actions refer to the mind’s performance in an analogical process. Consistent with another common model; however, the analogy should be defined as including two stages; in the first stage, the sample moves to the summarized plot, and then the summarized plot moves to the target. The use of experiences from different domains helps analogy to outline a structure to move towards the target. This model, discussed in many of the sources, is differentiated by being objective, which is attention to the origin and product of an analogical process. Later, attempts are made to create a synthesis of the two models previously introduced to provide a more reliable model.

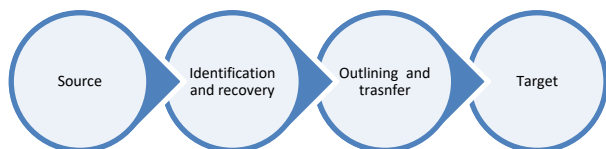


Image 10: Diagram of stages of using analogy (Source: authors)

Identification and recovery: In this stage, the subjects which are known based on a priori understanding are identified consistent with the subject characteristics; these characteristics potentially involve coordinates of solutions. These characteristics also help create a kind of representation of the problem in the mind. A method of this kind requires sources to have imperative guidelines of key terms and visual signs. Visual signs such as geometric shapes involve principles of the solutions. Gigg and Hughes maintain that when subjects are not raised explicitly, and there is no visual relation between them, they can face a problem in the stage of recovery and thus, causing the analogy principles

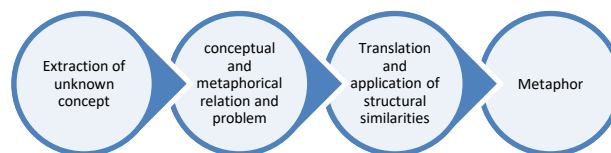


image 11: Use of metaphor in design using views of kasakin (source: authors)

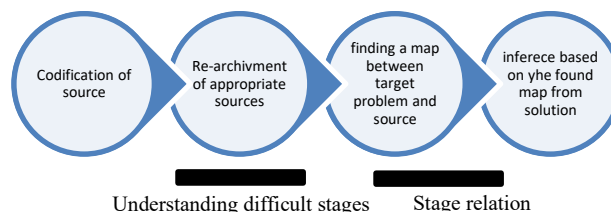


image 12: Diagram of using metaphor in degsign based on psychological approaches

impossible.

Outlining and transfer: When an analogy is recovered from a potential source, there will be a correspondence between “cause and effect” and “source and subject.” To develop the two models raised previously, there will be two categories of target and source in the analogical reasoning body, with the analogy path should be a product of two actions “identification and recovery” and “outlining and transfer.” Frazer and Henmi argue that architects make use of outlining to return to a priori patterns in their minds as a specific method of seeing and understanding a source in a special path [15]. The significance of this subject comes from the fact that it attempts to explore analogy from an objective and product-oriented view. These two models, although created independently of each other, do not work separately. In fact, the more accurate model of analogy should be sought in the synthesis of these two together.

6.5. Metaphor mechanisms

To study metaphor, two models were described which follow various goals. The first model emphasizes the process of metaphorical reasoning construction, and the second model refers to the process of creation and understanding of metaphor. The study of metaphorical construction enjoys a cognition-based nature. Problem-solving can be elaborated on due to the metaphorical reasoning in three practical stages: the first stage should be considered as the extraction of a set of unknown concepts in various domains, which are strongly interconnected, though they are not explicit. The second stage involves the creation of a plot of deep relations between the metaphorical concept and the problem, and the third stage refers to the translation and application of structural similarities between the metaphorical source and the intended issue that eventually end up in a new solution [4],[19]. Creation and understanding of the metaphors from a psychological perspective, as noted in image 12, begins when the individual learns a point from science. In the future, the individual confronts new issues and needs to obtain an appropriate idea to

sources and new situation creates a target. With the expansion of designs, there will be new intuitions [17]. In sum, as regards the usage of metaphorical and analogical reasoning, it is critical to suggest although these two are in the same direction, and metaphorical reasoning is a kind of analogical reasoning, the major metaphorical characteristics reveal that they involve an aspect of analogy and simile in it. The lack of a direct reference in a

6.6. Proportion of logical reasoning method in the representation of architectural work

After examining the ratio between analogy as a logical basic structure and defining its similarities and differences with metaphor, it is necessary to provide an image of the ratio of these two in the representation in the artwork (architecture). The importance of metaphor, as a type of analogy, is due to removing part of the elements of analogy, leads to the increase in the complexity of reading the architecture. Therefore, it was tried to formulate the concepts that were extracted in the analysis of the characteristics of analogy and metaphor in a model based on the relationship of the work with each of these reasoning methods.

Table 4: Hierarchical significance of metaphors for design purposes and criticism (Source: Antoniadis)

| Reasoning | | Metaphorical reasoning | | | | | | | |
|----------------------|--------------|------------------------|---------|--------------------|-------------------------------|---------------------|-----------------------|-------------|--|
| | | Differences | | | | | | | |
| Analogical reasoning | Similarities | interaction | context | heightened meaning | subjective nature of metaphor | problem development | recall or imagination | originality | |
| | | Process status | | | | | | | |
| | | similar context | | | | | | | |
| | | Reasoning function | | | | | | | |
| | | cognitive instrument | | | | | | | |
| | | conceptual structure | | | | | | | |
| | | interacted meaning | | | | | | | |

solve that new issue. The resolution of an appropriate metaphor is a difficult cognitive stage; it is a source of memories, as the design between

Such a model clarifies the relation of each of the concepts with each other, and can be a tool to measure the effect of the reasoning method on the

work of art. It should be said that artwork faces a range of representations due to architecture in the way of logical reasoning. It means that an artwork does not necessarily belong to an argumentative method in an absolute way. And it can search for a combination or oscillation between two or more reasoning methods in it.

7. Conclusion

As stated, the following can be proposed:

- In the process of using metaphorical and analogical logic reasoning, such stages as the extraction of sources and diverse concepts on the basis of the plot and source sameness, the relation of concepts and images with the design subject and their compatibility are key.
- The unique metaphorical structure, which originated from the removal of part of the analogy pillars, will create a kind of complexity in the artwork and help form a virtual language and creation of an added meaning when the work is read. A metaphor

can lead to the creation of different readiness for work.

- The more abstract the extracted sources, the more original solutions are expected. Metaphor is a process action that extends to the reading of the work.
- What creates originality in the metaphorical thing is the hidden meaning, as the user requires a kind of discovery to understand the causal relation of the work and the reference. This subject leads to the user's action.
- architecture can be reflect of argumentative features in design. in fluctuation between analogy and metaphor.

In design process studies, although the reasoning method is present quite seriously, it is less focused attention. The most important achievement of the present study is to de-marginalization of the reasoning manner and bring it to the context as the main research subject. This subject can provide grounds for the representation and transfer of knowledge of various knowledge domains into architecture.

(Translated by Ladan Etezadi), Sofeh, (1). https://soffeh.sbu.ac.ir/article_99454.html

Reference

1. Rezaei, Mahmoud.: 2014 A, Analytics of design, revision of ideas and concepts in the process of designing contemporary form and space. (First Edition). Tehran: Islamic Azad University - Tehran Central Universit. <https://civilica.com/doc/569050>
2. Chakrabarti & Blessing.: 2014, A Review of Theories and Models of Design. Journal of the Indian Institute of Science, 16(95), 25-10. <http://journal.library.iisc.ernet.in/index.php/iisc/article/view/4582>
3. Lawson, Brian.: 2016, How do designers think? Disambiguation of the design process. (Translated by Hamid Nadimi). (First Edition).: Shahid Beheshti Publications, Tehran.
4. Azimi, Maryam.: 2016, Metaphor and deduction, creative strategies for using visual resources in architectural design. The first competition of the Comprehensive International Conference on Engineering Sciences in Iran. Anzali: Conference Secretariat in collaboration with Tabriz University-Guilan University. <https://civilica.com/doc/545272/>
5. Dorst, K.: 2010, The Nature of Design Thinking. In DTRS8 interpreting design thinking.
6. Grout, Linda and Wang, David: Research Methods in Architecture. (Translated by Alireza Einifar). (C 1). University of Tehran, Tehran.
7. Goldschmidt, Gabriella.: 1991, Design industry, model architecture industry for architectural design, two-stage model theory. (Translated by Ladan Etezadi), Sofeh, (1). https://soffeh.sbu.ac.ir/article_99454.html
8. Schon, D.A.: 1983, The Reflective Practitioner: How Professionals Think in Action. Basic Books, New York
9. Antoniadis, Anthony C.: 2007, Architectural analogies, (Translated by Ahmad Reza Ay), (Third Edition, vols. 1 and 2). Soroush, Tehran
10. Batouei, Hossein; Rezaei, Mahmoud (2016, September). Rethinking the concept of metaphor in the scope of creating the space of architecture and literature (Case study: excellent general architectural works executed in Tehran 2005-2006). Third International Conference on Recent Innovations in Civil Engineering, Architecture and Urban Planning. Tehran: Nikan Institute of Higher Education / University of Tehran. <https://civilica.com/doc/569050/>
11. Lakov, G.; And Johnson, Theories of Communication. (C 4). Tehran: Research Institute for Cultural and Social Studies.
12. Hemmatyar, Erfan; Mohajernia, Mazaher; and Bastani, Mahyar.: 2015, Metaphor and its role in the plot. The Second Scientific Research Conference of New Horizons in the Field of Civil Engineering, Architecture, Culture and Urban Management of Iran. Tehran: Association for the Development and Promotion of Basic Sciences and Technologies. <https://civilica.com/doc/535082/>
13. Bayat, Benora; and Moghaddasi, Mohammad Mahdi.: 2014, Metaphor in the process of architectural design, Second International Congress on Structure, Architecture and Urban

- Development. Tabriz: Permanent Secretariat of the International Congress of Structure, Architecture and Urban Development. <https://civilica.com/doc/353818/>
14. Davoodi, Somayeh; and Ayatollahi, Seyed Mohammad Hossein.: 2008, What is a metaphor and how does it affect the production of a plot? *Soffeh*, (17). <https://www.sid.ir/paper/94273/fa>
 15. Khakzand, Mehdi; Muzaffar, Farhang; Faizi, Mohsen; And Azimi, Maryam.: 2009, Visual deduction and its place in creative teaching of architectural design. *Education Technology*, 4 (2). <https://doi.org/10.22061/tej.2009.1343>
 16. Borhanifar, Sahar; Mousavi, Seyed Jalil; Talischi, Gholamreza; And Mazhari, Mohammad Ibrahim.: April 2017, Transferring the meaning of a painting in architecture Recounting the meaning of a painting by Madame Dawsonville and the studio collection in the architecture of a wall house. *Bagh-e Nazar*.14, (16). http://www.bagh-sj.com/article_44375.html
 17. Khodaei, Talischi, Gholamreza; And Moghaddam Daneshgar, Golrokh.: 2013, The role of metaphor and metaphorical thinking in shaping the idea of architectural work. International Conference on Civil Engineering, Architecture and Sustainable Urban Development. Tabriz: Islamic Azad University, Tabriz Branch. <https://civilica.com/doc/273630/>
 18. Ghorbani, Manijeh.: September 2016, The effect of metaphor in increasing students' creativity in teaching architectural design. The Second National Congress on the Development of Technology Infrastructure of the Road and Construction Industry of Iran with a focus on resilience and crisis management. Tehran. <https://civilica.com/doc/914091/>
 19. Casakin, H.: 2007, Metaphors in Design Problem Solving: Implications for Creativity. *International Journal of Design*, 1(2), 21-3.