



Received: 29 January 2018
Accepted: 25 July 2018
First Published: 02 August 2018

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VISUAL & PERFORMING ARTS | RESEARCH ARTICLE

A meta-analytical attitude to the form–function relation in architecture using the concept of creativity

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Abstract: Architecture is an impressive area in human life, with the nature that returns to the design process in any way. Generally, the design is a motivated effort to satisfy human needs, which focuses on two main elements, *form* and *function*, in macroscale view of architecture. It is expanded that the relation between forms and their functions is the matter always considered due to the architectural essence. Accordingly, the main aim of this research is analyzing this relation and identifying its affecting factors based on recognizing the levels of human existence, as the user of architectural products. Therefore, this research was conducted by a qualitative content analysis, including the comparative–interpretative approach to identify key variables existing in related theoretical context and describe their connections, in terms of methodology. Regarding this, we tried to redefine the relationship between these two concepts (form and function) with a logical reasoning. Since the analytical investigation of our research was developed based on the previous theoreticians’ analytical processes, it could be considered as a qualitative meta-analysis



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PUBLIC INTEREST STATEMENT

Nowadays, the impact of architecture on the man is not covered, and many applied studies focus on how to manage it in different scales. But it is necessary to determine a theoretical framework for defining the proper approach to the issue, including all the factors involved in all aspects, without extremes. Man as the user of the built environment has various levels of existence (physical, psychological, and spiritual) that are seriously affected by the architectural features of surrounding space, and thus, his individual and social behaviors are influenced. Therefore, this article tries to criticize related theories, especially about the role of two main elements of architectural form and function in this problem with a temperate anthropological–psychological attitude in order to suggest a comprehensive theory. The matter can be considered as a foundation for future research in interdisciplinary areas of environmental design and behavioral sciences such as environmental psychology and to strengthen the advantages of them in human societies by directing their approaches.

study focusing on the related anthropological and psychological dimensions. According to the content proximity of the design and creativity natures, particularly in art and architecture, applying the concept of creativity to explain the form–function relation seems to be logical. Finally, a comprehensive conceptual model and associated manifest were presented that covers all of the studied theories in this regard.

Subjects: Environment & Philosophy; Environment & Society; Environment & Theory; Architecture; Philosophy of Art & Aesthetics; Theory of Art

Keywords: architectural design; creativity; form–function relation; environmental psychology; levels of human existence

1. Introduction

Architecture is so important in human societies because it is one of the most considerable artistic and practical areas affecting cultures. The nature of this discipline is of a design kind and subsequently involves in design knowledge in general and special. However, the particular features of the specific architectural temperament of theorization are the main reasons of disputing over explained theories of architecture and architectural design. Studying architectural history indicates its multidisciplinary nature because of an inevitable connection with other human sciences, though the way of considering the theory and theorization in architecture is somewhat different from other fields, which is mainly affected by artistic and literary attitudes. But it has been evolved by appearing the new science of environmental psychology and in other words, applying the common methods of behavioral science in critique and design of spaces. Here, one of the most important areas of theorizing in architectural design is the subject of the form–function relation that has been frequently presented in the basic sources of architectural history and is still hardly debated. Form and function are the two main constituents of architecture that its researchers in theoretical, professional, and pedagogical fields have investigated their inherent relation and priority in the design process frequently. Since architecture significantly influences human cultures, especially in the contemporary age, it is known as a cultural instrument (Love, 2013), and the mentioned relation is highly important in its educational and professional aspects as a challenging subject. Therefore, this question is always asked: “what is the link between these concepts and how could the answer lead to qualitative improvement of architecture education, professional works, and cultural enhancement, as a result?” In this regard, it should be pointed to the common maxim of modern architecture movement “form follows function” that has been explored and criticized by architectural theorists for several times subsequently and modified considerably although a comprehensive interpretation of this relation could not be found yet. Therefore, the main objective of this research is a precise concentration on the architectural form–function relation considering all of its probably important aspects of human (as the user) to present a general manifest. According to the essential role of creativity in architecture, it seems that we should search in the domain of architectural design creativity to find the all-around answer. Thus, this article focuses on recognizing and redefining the architectural form–function relation using the concept of creativity with an anthropological–psychological approach.

2. Literature review

According to the subject discussed in this research, the literature review is divided into the following two parts.

2.1. Creativity and architectural design

Due to its nature as God blessing and most similar attribution between man and his creator, creativity is a significant concept and has a complicated structure. In addition, passing the bottlenecks, dominating the surrounding environments, and solving the life problems would be possible only by creativeness. Although many studies have been done on this matter, it is still

called as one of the most mysterious topics in the human thoughtful manner. On one hand, some researchers believe that it is a social phenomenon and raises from social needs and conditions or familial situation. On the other hand, some experts consider the creativity as a personal subject influenced by factors such as motivation, emotion, excitement, and personal learning. Another group assumes it as a cognitive concept correlated with the supreme processes of mind (e.g. thought, intelligence, imagination, and information processing). Others explain this concept as a multidimensional phenomenon involved in a complex of social and cognitive factors, so that the environmental factors influence it in all possible aspects (Golestan Hashemi, 2008). Accordingly, creativity is the personal ability to produce novel phenomena, ideas, insights, theories, and so on and applying them in the life generally, so it is precious in terms of scientific, aesthetic, and social aspects (Mahdavinezhad, Mahdavinezhad, & Silvayeh, 2014). Three common underlying features of creativity presented by MacKinnon (1962) and emphasized by Mayer (1999) are considered in this research. These main features of the real creativity are a novelty or statistical infrequency; being situated in reality while having a recognizable goal; and having a process nature through a given period and characterized by originality, adaptability, and realizability with a sustained development of the original idea (MacKinnon, 1962). In order to categorize this concept in its possible types, it should be noted that the creativity occurs as a continuum between big-C creativity (instant creativity) that changes culture and history and small-c creativity (everyday creativity) by which people solve problems and improve their work and life (Amabile, 1983; Runco, 2007; Simonton, 2005). In addition, two types of creativity could be concluded from the literature review. The first type is scientific creativity that is more related to the person's intelligence and logical thinking in doing professional work and creating of new aspects of sciences and technologies. The second type is artistic creativity that is more connected to the intuition that leads to a kind of divergent thinking in aesthetic areas. It is believed that there is somewhat professional or scientific creativity in all people, and its variable amount is influenced by numerous factors, but the artistic or nonscientific creativity is only in the exclusivity of artists who are familiar to the world of the inspiration and intuition.

However, design is a set of motivational actions to systematically solve an important certain problem that includes various perceptual, cognitive, and behavioral subprocesses (Emo, B. Al-Sayed & Varoudis, 2016). This statement declares the general creative and innovative aspect of design and consequently architectural design, regarding the role of human motivations and his tendency to the diversity and novelty. The architectural design is a process arranged and generalized by different ways, including various decision makings evolved during consecutive phases to produce an imaginary concept of reality in the future (Shiremberg, 2005). It is expanded that all of these stages are the kind of thinking done consciously and semi-consciously or even unconsciously (intuitive) (Kheirollahi, 2013). To confirm the proximity of the design and creativity, Taura and Nagai (2017) in an article titled "Creativity in innovation design: the roles of intuition, synthesis, and hypothesis" emphasized the crucial role of intuition in decision-making step of the design process. Furthermore, Lawson (1994) in his book "Design in mind" has declared that design is the creation of new things and, therefore, an innovative activity. These statements, especially in the general application of the term "creation", refer to the inevitable nature of creativeness in design as in many models of the design process, all stages are same to the creativity occurrence including preparation, incubation, insight, and elaboration (Mozaffar & Khakzand, 2009). Therefore, the main properties of the design process are being "research, thought, and creativity" based that eventually resulted in a decision (Laseau, 1980). Then, it should be acknowledged that design has two creative sides, namely, logical and intuitive; the former has a conscious nature and the latter has a fluent one from conscious to unconscious (Abdellatif Abo Wardah1 & Khalil, 2016). Similarly, architectural creativity means the creation of any innovation in concept, style, or body of the product, and the main difference between the artistic fields such as architecture and other subjects is in the necessity of applying intuitive creativity and innovation in addition to utilizing intelligence, logic, reasoning, and so on (Sobhiyah, Bemanian, & Keshtiban, 2008).

Architecture should satisfy various needs and demands, so this matter increasingly relates it to different scientific areas. Regarding this fact, the determination of probable needs and demands in the design process leads to define architectural functions and eventually design a form in response to them. Then, the major fundamentals of an architectural product are its functions and form that are naturally consecutive in considering and defining stages while are simultaneous in the design phase of creation. Regarding the necessity of summarizing and refining of the abundant amounts of information during the above-mentioned stages in the up-down approach of the design process to achieve the goals, the basic role of the architectural concept as an inevitable middle product is completely obvious (Hadiyan & Pourmand, 2014).

With all the above, it should be noted that there are two grand types of creativity in design in terms of the origin, one in the context of process and the other one related to the product, and both are important in the whole design (Taura & Nagai, 2013). However, despite this importance and its comprehensiveness in the design process, the main role of creativity, especially in artistic and intuitive forms, is relevant to the design aspect of the product, particularly on the architectural concept resulted from the primary stages of this process. This subject is highly considerable in the architecture, since simultaneous use of the intelligence and logical thinking (convergent thinking) in association with the power of creativity (divergent thinking) would result in the progress of an architectural design process in the right way and eventually successfully achieving the product as the response for all probable needs of the users.

2.2. Contemporary theories in form–function relation

Since this article focuses on a contemporary subject, related theories presented from the beginning of modernism period to now in architectural history have been precisely considered. Although the major principles and theories were established by the modern architectural movement, it did not succeed in describing the relationship between architectural form and function appropriately even at the peak of its prosperity time. Inadequate perception of human multidimensional nature and needs and consequently an imperfect illustration of architectural function as the significant tool to satisfy these requirements resulted in this failure. It is worth noting that this movement has had a fundamental role in the development of environmental psychology knowledge. It is explained that the criticisms and comments on boring and crime-potential spaces in modern residential complexes or even cities could be known as the starting point for the necessity perception of considering human needs for the desirable environment. According to Alexander's (1979) statement, disconnecting the pattern of events occurring in buildings and cities, which dominate the life, from their contextual spaces is not possible. In this regard, it could be said that creating changes in the architectural elements of the environment or its affordances can alert man behaviors, especially in social level (Motalebi, 2002). In addition, in his book "Creating architectural theory: the role of the behavioral sciences in environmental design," Lang (1987) had stated that the physical environment is indeed a behavioral setting which could be a facilitator or obstacle to human behaviors. However, it is not their determining factor at all, since man needs and motivation are the principal agents determining his manner. Utilizing the same concept, Rapoport (1990) has concluded different situations in the frame of three common theories about how the physical environment and man behaviors interact with each other (determinism, possibilism, and probabilism). The meaning of an environment would also be the result of the interaction between the environmental affordances and probable personal or social demands of its users.

Regarding all of the above, it could be claimed that the maxim "*form follows function*" as one of the main theories offered by the modern architectural movement has originated from a mono-dimensional and superficial attitude for the concept of function, quite apart from the aesthetic aspects and meaning. Hence, it delivers such a restricted display for the relation of the human and his needs with the architecture. The roots of this defect should be searched in the physical determinism as a principal opinion in those years, which has led to a predestined relation between form and function. Because it seems logical to apply the term "potential functions" corresponding to variable desires, consequently, the meaning of environment could be investigated at various

levels regarding the changes in man demands through different temporal or local conditions. However, the environment or object affordances are dependent on the observers' characteristics, experiences, competencies, and needs. Hence, an environment may include certain affordances for a particular person, but those would be meaningless and vague for another person because of the lack of knowledge about their presence (Motalebi, 2002). Based on these potential and variable affordances, the implications such as meaning, aesthetics, and approbation may be formed in the user's mind and actualized in fact.

Investigating the architectural literature indicates that various theoreticians have concentrated on the matter of form–function relation in order to provide a more suitable relational image between the architectural form and function after propagating the main maxim of modern architecture. For a prominent example, Venturi (1966) remarked on the inevitable multifunctionality of spaces and, thus, the necessity of multi-meaning structure of their corresponding architectural forms in his famous book titled “Complexity and contradiction in architecture”. He believes that the plurality of the meaning and functions may enhance the intensity of spatial positive ambiguity and result in architectural spaces' liveliness. Accordingly, he criticized the attitude of the modern architects who follow the modernism common maxim (form following function and so the belief in having just one meaning) in their works. Therefore, an architectural design should be done for multifunctionality, compatibility, and adaptability regardless of the usage of subject or scale in order to satisfy different changes in human needs over the time. Based on this idea, the viewpoint of flexible design and the existence of multipurpose spaces in a neutral and fixed form in various architectural works could be obviously proved (Padovan, 2002). For example, Wright believes that the architectural functionalism is not apart from the form; rather their perfect unity is desired so that he has used the term “*plastic continuity*” which is his obvious manifestation. Accordingly, formal flexibility associated with the architectural function in a form of concrete circular ramps could be seen in his famous work, the Guggenheim Museum in New York (Wright, 1941). In addition, Kahn's statements are interesting in which he mentions the inherent demands of spaces and even their constituent materials/elements according to their capabilities. Thus, a predetermined total form might inhibit what the various spaces want to be (Kahn in Latour, 1991: 60). In fact, Kahn's interpretations point to his understanding and employing the concept of potential affordances of objects and their forms that were not taken into consideration at his time.

As we mentioned before, from Venturi's point of view, buildings and their forms should epitomize different meanings for various users and suggest multiple functions as a result. According to his attitude, considering the concept “*multifunctionality*” in the maxim of modern architecture would be necessary to approach a correct theory, and based on this, he presented his theory “*form evokes function*” (Venturi, 1966). So, the central role of form as the motivating factor for the human mind to create and perceive the meaning and conduct the behaviors is visible in his theory. This matter could be criticized, as Motalebi (2006) did in his article titled “Recognizing the ratio of form and function”: Since based on the nature of the form, it is quite free of the intent and meaning, and in contrast, it is human motivation and his wishes using the form to create his intended meanings in a targeted way. For this reason, Alexander (1979) says, “architectural forms get on neutrality and timelessness according to the features such as multi-functionality and variability of function during the time”. Nevertheless, the term “*evoke*” by Venturi is due to a predestined relation between the form and function and would be criticized because of the same physical determinism roots in the maxim of modern architecture that is under debate yet. According to this matter, Motalebi (2006) proposed a considerable hypothesis using the Gibson's concept of environmental affordances and eventually introduced it as a comprehensive theory in architecture. Utilizing the term “*afford*” of Gibson's theory instead of “*follow*” in the modern architecture maxim and the term “*function*” in the plural form, Motalebi (2006; 61) presented his theory: “*form affords functions*”. He claims that the concept of affordance has enough potential for expanding the concept of function, especially in association with the built environments. Based on this premise, the function of a space would be recognized before its form perception, and thus, the space functions influence its form, not vice versa. However, the forms should have the essential capabilities to accept those functions and afford them (Motalebi, 2006).

Eventually, building users of any kind can expect various functions depending on their requirements at any time. Proposing this, Motalebi tries to declare his probabilistic attitude against the deterministic approach of the modern architecture maxim.

In this regard and with different approaches, Murgul and Vatin (2014) proposed various situations from the “form completely following function” to absolute separation of them and even lack of the interpretable relation. Dascher (2016) also confirmed the following of form from function in an article titled “Function follows form”, but he suggested a simultaneous opposite relation and in other words, a mutual correlation, especially in the macroscale of urbanism.

3. Method and theoretical framework

This study has been carried out by a qualitative content analysis using a descriptive–interpretative approach in order to identify the main variables presenting in the contemporary theories released about the architectural form–function relation. Then, it aims to precise and redefine their links in an anthropological–psychological context, and in fact, the final goal of this attempt is to achieve a comprehensive theory about the relation between them. For this purpose, the required concepts and structures were explained in detail through the literature review, and consecutively, in this part, the related theories are interpreted and critically analyzed with inductive reasoning under a comparative approach. Accordingly, we attempted to interfere and precise any probable relation by referring to relevant findings from the previous part to provide the final theorization as a result. Since the analytical effort in this study is based on the various analytical processes used by different previous theoreticians and researchers, it could be considered as a qualitative meta-analysis that has anthropological and psychological aspects regarding the research concentration on the levels of human existence, especially his psyche.

3.1. Analytical process

Regarding the multidimensional attitude of the study, it is obvious that the concepts “Need” and “Motivation” related to the architectural function and “meaning” and “beauty” according to the architectural form have the crucial role in the domain of the research subject. Therefore, the precise interpretation of these terms will be derived from this analytical section in order to accurately redefine these fundamentals.

3.1.1. Need–motivation ratio in relation to architectural function

At first, the concept of the function must be declared correctly and comprehensively to avoid restricting its meaning to what is attributed to the modern architectural movement. In order to achieve this aim, comprehensive attention to human needs from different sides, namely, physical, mental, and spiritual, is necessary. The man is a complicated creation having various physical, psychological, and spiritual needs that their corresponding motivation is counted as the power to conduct and organize his cognition and manner. The behavior is also taken into account for satisfying needs and demands, and therefore, it is highly necessary for the environmental designers to meet the man needs. From Maslow’s point of view, human motivation should be certainly considered as the satisfying factors of these needs, so someone changes the physical environment levels for adapting its affordances to his needs (Motalebi, 2002). With this explanation, the design is a motivated effort having a nature of creativity to satisfy human needs in a certain field and with a desirable quality. Since one of the supreme levels of human needs is the beauty related to diversity and novelty, the creative nature of design sparks in this context. Unlike the Lang’s idea (human needs lead to his motivation), Motalebi states that the motivation is prior to the needs. He justifies this claim by referring to Maslow (1954) and his book title “Motivation and personality” (Motalebi, 2015). Nevertheless, it seems that the priority of human needs to his motivation is reasonable only for the basic needs, and the motivation is the precedence of the need for the higher needs that change in each person with certain personal features. For example, someone would not be motivated to prepare the food for eating until there is a feeling of hunger (the need for eating). While the quality of meeting the need in the same cases of hunger feeling is

different for various individuals (eating as satisfying the basic need and eating a special food as a reply to the higher need based on the variable motivation).

Accordingly, the definition of the term “*function*” would contain the matter of usefulness in physical and partially nonphysical (psychological) aspects. Similar to the new literature of functionalism in which the function is directly related to the concepts such as usefulness, practicality, and consistency with the purpose and necessity. Thus, the function in this definition focuses on the practical aspects of architecture to satisfy human environmental needs, same as its modernist intention. Furthermore, it would be considered in a range beyond the practical needs and their corresponding spaces because of its inclusion in physical, behavioral, and interactive aspects of man. With this explanation, the architectural function is not only related to the practical aspect, but it is also connected to the man–environment relation in all of his existence levels (Gharibpour, 2013). Having such a strong relation, considering the function in the architectural design should be confronted with all the architectural aspects related to the man in various contexts, namely, cultural, social, historical, geographical, and so on.

3.1.2. *Aesthetic meaning in relation to architectural form*

As this article focuses on the impressibility and effectiveness of the architectural form, it is necessary to declare the concept of the form and its features obviously. Although many definitions exist in different areas, generally the form is the way in which an object comes to be present (*Oxford Dictionary*). Considering the semantic features of the form significantly, so according to the aims of this research, the form is the comprehensible identity and personality of an object by which not only the thing might be realized, but also it is distinguished from the others. In addition, representing the composition system and structural relations in a complex, it is the reflective factor of the organization of components in a whole integrity. Therefore, with practical and abstract aspects, the form is capable of being mind-perceived, and it is worth to note that the concept of the form is highly close to the sense of receiving the meaning and beauty so that the special levels could be imagined for it (Zafarmand, 2002).

The meaning and beauty, as the attributes of the form, are the two distinct concepts that are related to each other and to human mental and emotional values, which are understood by the sensory perceptions. In this regard, Pallasmaa’s (2012) statement is considerable in which he believes that architecture is the art of compromising between our surrounding world and us that would be occurred by the sensory perceptions. In other words, he indirectly indicates the correlation between form, meaning, and beauty in architecture. Two principal subjects in architecture are the meaning and the beauty of the final product, and accordingly, the architectural aesthetics focuses on investigating the environmental feelings and the location of the person in the built environment. For this and due to the correlation between the interpretation and evaluation (Kelly, Winters, & Cooper, 2005), the meaning could be considered as the value of the art that results in the beauty. Therefore, the concern of architecture or any symbolic environmental design is the identification and introduction of hidden meanings and concepts of the built environment. Then, the resulted artwork would be a medium to transfer semantic messages.

Depending on different conditions, human needs and demands vary in various periods of his life, so the environmental meanings should be also considered in its multiple levels. Table 1 presents this variety corresponding to the range of environmental affordances from the Gibson’s point of view. According to what was discussed, the beauty and meaning may be defined by the responsibility amount of the architectural work affordances in satisfying various user needs and demands. In fact, it is possible to consider the constant form with variable functions, while its meaning and subsequently beauty would not be fixed and predetermined.

Table 1. Different semantic levels of the built environment (Gibson, 1977)

Semantic levels	Concentration	Description
1	Static and stable	Emphasizing on physical resistance and stability of the building
2	Useful	Identifying the practically proper capability of the building in a special or unexpected function
3	Functional	Indicating fixed and predetermined functions of the building
4	Worth oriented	Dealing with the emotional aspects of the building related to its users
5	Semiotic	Including the meanings and concepts common in the other areas of human sciences
6	Symbolic	Particular levels of semiotic meaning involved in nonphysical concepts which are covered by the physical aspects of the building

It should be noted that the success rate of a work in achieving a high level of this conformity and providing more potential and effective affordances depends on various factors; one of the most fundamental of those is the development of the architectural creativity during the design process.

3.2. Meta-analytical approach

As mentioned before, the maxim “*form follows function*” needs to be reformed as an architectural theory. In other words, this should be presented in a new shape of “*form also follows functions*”. Because the relation pointed in this sentence is not a kind of causality, it should be redefined as a kind of correlative relation. Furthermore, it seems that in addition to functions, a form has other correlatives that we were looking for them during this research. In the regard of Venturi’s attempt for amending the maxim of modern architecture, his theory rose up to “*form evokes function*”, and this declaration absolutely induces a deterministic relation between form and function, while it does not seem reasonable. He uses the verb “*evoke*” meaning the terms “*call*” and “*invite*” in this statement. Therefore, it could be presumed that form stimulates the meaning and directs the human behaviors. Nevertheless, this presumption does not seem to be logical, as mentioned before, because the form is inherently free of any meaning, and it is human motivation and willingness that equip the form with the meaning and purpose. Here, referring to the results of the previous argument about transposition of need and motivation is quite relevant. Since the architectural form is influenced by the human higher and complementary needs (i.e. transcendental symbolic aspects and high aesthetic levels), according to the theoretical approach of this research, we can say that the motivation precedes the form. Based on this and in continuing the efforts to reform the maxim, Motalebi (2006) posited his amendatory theory using Gibson’s concept of affordance: “*form affords functions*”. Despite its conveyance of new and worthwhile contents, neither Motalebi’s theory is comprehensive yet. With an ultra-postmodern attitude, he covers the whole conceptual content of beauty just under the term “*function*” and reasons that the essence of beauty is responsible for man pleasure so that it would be associated with usefulness. However, it is worth noting that he did not consider that the usefulness is defined in relation to scientific matters and has no significant role in the human belief system and ideology-based affairs (i.e. sanctities, morality, and even aesthetics). In fact, science, philosophy, and religion are different areas, and each subject of them would be applied in its own special limitation of the human life. From the scientific viewpoint, everything is formulated and could be provable or deniable by logical reasoning. Therefore, we should consider that there is a serious doubt about the possibility of achieving true answer by scientific interference in all issues, including moralities or sanctities. As respects, any subject related to the circle of belief is not provable or deniable in the world scientific scope (i.e. rationality and experimentality), but it

should be located in the territory of intuitive senses. For instance, those scientific reasons proving God, deny him too, as Kant (1781) said in his critique of Descartes' discursive proof of God's existence. In Kant's opinion as a religious person, it is necessary to separate areas of the religion and philosophy from the science and rationality. Therefore, these issues should not be merged together. Hence, rational and experimental affairs are beneficial for the man just in science-related fields, while moral matters (e.g. justice, equity, and emancipation) and, above all, sacred affairs (that are motivated by human beliefs) are different from science and scientific experiences so that the matter of usefulness is not meaningful in these subjects as is commonly known. Therefore, we can say that the science does not create morality, but it would cause moral advantages. For example, Newman's (1996) theory of defensible spaces is useful to prevent the occurrence of crime in a physical environment, so it influences the criminal's performance but does not change his bad intentions.

Based on the logic discussed above, it is necessary to admit that the main section of aesthetics connects to the human sacred affairs and his beliefs. For this, conceptualism, symbolism, abstraction, and ultimately the sense of beauty in all levels could not be completely considered in scientific areas. Accordingly, it could be claimed that referring the design process in architecture to pure scientific aspects does not seem to be possible using any method, and so the science could be only useful in this process. Therefore, the claim that behavioral sciences are capable of eliminating the common differences in interests like what usually exists between the maker, designer, and user of a building is definitely not true, because their complicated nature could not be ignored easily. However, by utilizing scientific methods correctly and especially considering the behavioral sciences corresponded to their natural and behavioral matters certainly; these gaps could be reduced significantly. Nevertheless, as previously indicated, the human has also other dimensions so that his belief, sanctity, ideology, and even philosophy systems are quite out of the scientific fields. Then, the considered gap is counted as an uncontrollable issue as far as it relates to the nonscientific areas, and its elimination is not completely possible.

Hereafter, we can critically analyze Motalebi reasoning in the absolute overlapping of the function and beauty. Describing that if the beauty is useful, how both beauty and ugliness of a unique building simultaneously are explainable for different persons? Is it useful for someone and detrimental for the others? Therefore, it seems that the maxim "*form affords functions*" satisfies the requisite condition, but it is not sufficient yet, and in fact, it goes forward just to the scientific borders. In other words, it deals with some lower levels of aesthetics, but it would be deprived of the supreme dignities of the beauty. Thus, not only the form should afford and evoke functions but also it must provide what is beyond them.

In Lang's viewpoint and his followers' (such as Motalebi) about the application of the common methods of the behavioral sciences in design and critique of spaces, the concept of the function is expanded to the boundary that completely covers all the aesthetic levels. However, they frequently remark on the role of the artist's power of intuition and creation in this process. Accordingly, it should be acknowledged that the new arrival of the theories related behavioral sciences in architecture is an extremist attitude against the wastage of the modern architecture in defining the concept of function in the words "*form follows function*". Since the term "*function*" dominates all the aesthetic matters in these new theories and it is a hyper-comprehensive ultra-postmodern interpretation, the function is incomplete with its concept attributed to the modernism, while it should be considered by a temperate attitude between these.

In this regard and based on the interstitial attitude of this study, it must be focused on a comprehensive concept containing the term of function and more. Then, the authors apply the expression "*human demands*" for this reason and divide these demands into two categories of functional and aesthetic, having a considerable overlap in a major part but not completely. It should be noted that in this categorization, the functional demands include the physical and psychological requirements, and the proper responses to them are exclusive to the science borders

absolutely. However, the aesthetic demands include psychological and sacred (based on ideology and human belief system) ones, and satisfying the first set is possible using scientific methods certainly, but for the latter, there is not such a certainty, so the other nonscientific preparations should be considered. Therefore, the function covers the concept of beauty as far as it is related to the man's mind and psyche just as the matter of science, and it does not rise beyond the line where the personal ideology and belief are sparked. According to the main contribution of different natural, behavioral, and technical sciences to architecture, the architectural function covers the concept of usefulness in all these areas. After this level, the nature of abstraction in the art will be emphasized, because the applied art of architecture has surely transcendental levels of abstraction too. For this reason, the aesthetics in architecture should be noted in all of the physical and mental (functional) and sacramental (meta-functional) aspects. Then, corresponding to this fact, we should search for an appropriate statement to complete Motalebi's theory. In other words, not in the modern extraction, but in a temperate-postmodern interpretation, the term "function" is a suitable representative until the matter is related to the physical and upper, psychic needs (e.g. safety, self-actualization, and self-esteem). In this regard, the scientific methods and the positive theories are much more effective in design certainly. Nevertheless, where the demands are considered in the supreme levels of what is related to ideology, the aesthetic needs appear in meta-functional aspects (belief, spirituality, morality, etc.), so the scientific methods could not be reliable alone. In these cases, it is the artist's power of intuition considered as much as his special abilities (pointing to the normative theories in design).

We can also say that separating form from scientific issues in some aspects of aesthetics due to its partial supernatural nature has considerable effects on scientific and functional usefulness and subsequently induces more desired feelings. It is obvious that this statement clarifies the before-mentioned indirect relation between the architectural form and function regarding some levels of human existence (spiritualities) and somehow indicates the functional perfectionism. Therefore, it should be noted that in addition to following the functions, the form evokes and affords them and even proceeds beyond these to enhance their perfection grade in a context of probability. Furthermore, contrary to Motalebi's opinion that used the term "afford" to underline the physical probabilism in his theory, it does not seem that this concept can represent such an intention obviously. Since based on the claim of himself, Gibson does not account environmental affordances as the factors related to the probable needs and demands of human, rather he believes that they are definite and always exist (Motalebi, 2006). Therefore, as Gibson also considered, the concept of affordance covers just potentials to exist in a permanent context, and it does not pay attention to needed situations occurring to actualize them. Then, utilizing this term in Motalebi's theory could not be illustrative for such a physical probabilism consented by both environmental psychologists and contemporary design researchers.

To solve this complicated problem, focus on the role of creativity in discussion subject seems to be highly efficient. As mentioned in the literature review, there are two main types of creativity: professional and artistic involved in scientific and nonscientific areas (action and abstraction), respectively. Thus, it is concluded that the requisite of architectural design as a mixture of art and science is the creativity in all types. In fact, the functional aspects of architecture have a scientific nature and require the scientific creativity, while some levels of its aesthetic aspects are absolutely attached to the artistic or intuitive creativity. Eventually, according to the relation of the form and function in the architectural design, as two parallel and simultaneous matters, it is necessary to apply both scientific and artistic creativity together in order to match them and actualize their considered ratio. It is explained that a systematic approach to the architectural design process on a macroscale includes three subprocesses: the gathering of information prior to the design, formation of an architectural concept, and evaluation and feasibility study of the concept. So, the inputs/outputs of these stages are consecutive: confronting with and recognizing the problem; creating the architectural concept as a middle product; analyzing the concept; and, finally, the problem-solving. With this explanation, it should be noted that the main processor in all

mentioned stages is creative thinking in the combinational form of scientific (logical) and artistic (intuitive) aspects illustrated in Figure 1.

In addition, the creativity is an ability closely related to the possibility and probability, so it may be objectively used to redefine the form–function relation. Actually, we can state that “*Form is created based on human demands and makes various levels of their actualization possible*”. It is expanded that the form is created based on probable diverse demands of man, affording required functions and meta-functions as far as quantity and quality of its emerging creativity in different aspects makes satisfaction of human basic and higher needs possible in various levels. In this manifest, we replaced the term “*function*” by “*demand*” to cover both aspects of human needs: functional and meta-functional. The discussed demands contain all aspects of function and aesthetics with their overlap in a certain scientific extent (i.e. behavioral sciences and psychological dimensions). In other words, different levels of potential affordances of the form are available to satisfy a wide range of probable demands in all kinds. In respect of this, it could be claimed that the main providing element in this process is architectural creativity, and different states of the success would be achievable according to the quantitative and qualitative levels of its appearance. This statement especially demonstrates that the form is created to satisfy all functions and probably beyond it. It should be noted that more pleasant feeling and experiencing functional satisfaction are expected as the results of answering aesthetic aspects of abstraction and especially sanctities (refer to the perfectionism mentioned previously). In addition, the term “*create*” in our statement points to the concept of creativity implicated both of possibility and probability. Thus, the concepts such as “*follow,*” “*afford,*” and “*evoke*” are also somehow concealed in this attitude.

4. Results and discussion

In this research, we analyzed the main presented concepts in contemporary theories related to the architectural form–function ratio and the roots of their emergence in the design process, based on an anthropological and psychological approach. Subsequently, our meta-analytical attitude resulted in a theory about their rational relations, whose associated conceptual model is shown in Figure 2, with the main components as follows:

- (1) The human needs as the inception point of the conceptual framework, especially in the kind of higher level related to human motivation. These variables could be nominated as the main driver of the demands and desires.
- (2) The human demands including all the functional and meta-functional aspects of probable various needs.
- (3) The motivation that influences the relationship between the human needs and his desired demands (considering functions and meta-functions) on one hand, and it affects the quality and quantity of creativity fostering in the context of the design process on the other hand.

Figure 1. The role and importance levels of the different aspects of creativity in the architectural design process (Source: Authors).

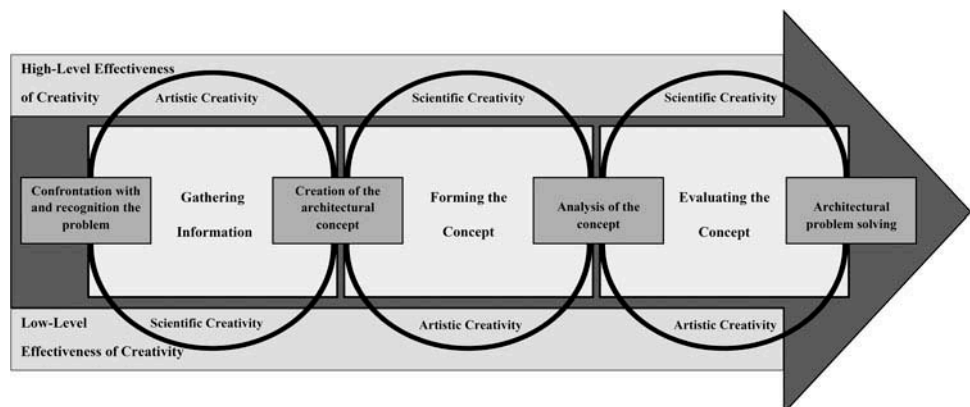
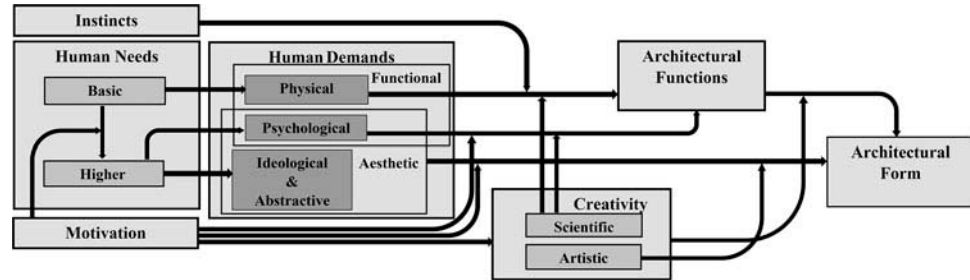


Figure 2. The proposed conceptual model of the research (Source: Authors).



- (4) The architectural functions that could be physical; psychological; and, therefore, somewhat of aesthetic aspects.
- (5) The architectural meta-functions (hidden in the model) that are spiritual and, thus, contain supreme levels of aesthetics (ideological and abstractive).
- (6) The architectural creativity whose quality and quantity affect the link between the human demands and the definition of their corresponding functions scientifically. In addition, its different aspects (scientific and artistic) play the principal role in creating the form and its potential affordances to answer the necessary functions and other probable human demands (meta-functional aspect).
- (7) The architectural form presenting affordances to satisfy the functions and meta-functions and in other words, the entire probable human demands.

According to what was presented, as Gibson also believed, the meaning has different physical; mental or psychological; and, finally, spiritual levels, and the beauty resulted from its perception has various grades, as well. Therefore, scientific methodologies and established principles of aesthetics are substantially effective to actualize the perception of a semantic process and its resulted sense of beauty. However, this effectiveness would be considerable up to the intersection of two conceptual domains of the function and beauty (i.e. the mind that is subject of discussion in the behavioral sciences). Furthermore, these approaches are somewhat helpful in the levels beyond what was described above (the dignity of sanctity), but they are not so reliable, and in this regard, the subject of intuition and inspiration should be concentrated more. Meanwhile, it should be noted that a formal concept may have functional and meta-functional dimensions and, therefore, involves both types of creativity.

5. Conclusions

According to the increasing development of related sciences in architecture during contemporary age, this study focused on recognizing and eventually redefining the form–function relation in architectural design, inevitably. The main purpose of the present research was achieving a comprehensive definition of this relation and declaration of its effective components using an attitude based on the cognition of human existence levels. For this reason, we investigated famous related theories published from the beginning of modernism until now. Concentrating the reasons and analyses presented by well-known theoreticians and architects, the strength and weakness points of their theories have been discussed. It is clear that the majority of these theories agreed with the principal maxim of modern architectural doctrine “*form follows function*” as a requisite of architectural design which is the basic theory in this article too. However, the main critique on the studied theories is that this maxim is not sufficient and needs to be reformed. For this, the research outcome provided a considerable theory based on the analyses of the past theoreticians and researchers using a critical qualitative meta-analysis. In this process, we considered different aspects of human existence from physical, mental or psychological, to sacramental dimensions. In addition, the authors focused on the key-related concepts such as “*need*” and “*motivation*”, “*meaning*” and “*beauty*” to make the best results. It should be noted that “*form follows function*” as our theory foundation was gradually purified passing the filter of behavioral sciences and

environmental psychology with a moderate manipulation. Eventually, we presented our analysis results in the frame “*Form is created based on human demands and makes various levels of their actualization possible*”, in which the term “*function*” was replaced by “*demand*” to provide a comprehensive content. This term is more extensive than “*function*” in the conceptual view so that only a part of its meaning can completely contain functional aspects. In other words, the architectural function represents some levels of human demands and ignores the wide range of meta-functional (supernatural) dimensions. Furthermore, in this expression, we tried to display the approach of physical probabilism and indirectly indicate the concept of creativity in both types (scientific and artistic) as the main factor in the mentioned relation actualization and achievement to its higher levels. It is concluded that the scientific creativity completely occurs in the whole design process and its product and conducts the route of evolution in design procedurally. Nevertheless, artistic creativity is more about the product aspect of design, and its most significant concern is concentrated on the creation of the formal concept that is actually critical in architecture regarding what was argued about the prominent affording role of the form in throughout this totality. Ultimately, it could be claimed that the final theory of the research includes all concepts of “*follow*”, “*afford*”, “*evoke*”, and “*perfectionism*” in a probabilistic context.

Funding

The authors received no direct funding for this research.

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This paper is based on the Ph.D. Dissertation of Hossein Rezaei, entitled “Investigating the Psychological Impacts of the Place on the Creativity of the Users of Environment (Case Study: Physical Influence of the Educational Spaces on the Creativity of the Students of Architecture)” that was conducted under the supervision of Dr. Ghazal Keramati and advising of Dr. Mozayan Dehbashi Sharif and Dr. Mohammadreza Nasirsalami at Architecture Department, Faculty of Architecture and Urbanism, Central Tehran Branch, Islamic Azad University, Tehran, Iran.

Citation information

Cite this article as: A meta-analytical attitude to the form-function relation in architecture using the concept of creativity, Hossein Rezaei, Ghazal Keramati, Mozayan Dehbashi Sharif & Mohammadreza Nasirsalami, *Cogent Arts & Humanities* (2018), 5: 1506602.

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