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ENVIRONMENTAL DESIGN – APPLIED THEORY DEVELOPMENT

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Abstract. *This scientific proposal aims to combine efforts to develop a basis for applied theory of environmental design, where the principles of building and optimizing the human habitat will establish. The research methodology consists in the simulation of axioms, postulates and statements that can form an analytical apparatus for applied science. The scientific novelty of the work consists in statement the first edition of principles and axioms, that may take place in the theory of environmental design. Bringing a scientific base on a certain type of art, which is design, with the possibility of objective understandings and predictions for obtaining the necessary results for being quality of human habitat development.*

Background. The lack of a single treatise or applied theory of designing the optimal human environment is an actual scientific problem. Applied theory of Environmental Design (ED) is possible as system of knowledge. As known, all material objects, processes & occurrences can be classified as developing system. Manmade habitat is developing with nature and human consciousness developing. It is two main factors of «second nature» formation, as accepted to call the manmade environment for human being. Therefore, it is relevant to study the possibilities of defining the basic principles of ED theory.

Analysis of recent research and publications. Among the main areas of solving this problem, identified in the resources of the world scientific periodicals can be allocated [1, 2], but they are not considered principal complex of design theory. There are small important bricks for ED theory. The study found that the design of an architectural environment formed based on the module possesses high aesthetic value, dynamism, interactivity and actively interacts with the human consciousness. The purpose of these research is to determine the size of a living space and how different people perceive it. The results showed that living space has cultural roots and is a continuum of five levels: content and concepts, spatial elements, formal and spatial structures, life ability (the presence of people in the form of family and social groups), as well as functional level.

The author of [3] create greener, sustainable buildings that rejoice in bringing together science and art. Its good practical experience as base for ED theory developing.

And the work [4] is dedicated to ecology aspects of environmental design, but there is an unresolved issue systematization obtained knowledge and proposals. Showing how

traditionally independent disciplines can be integrated simultaneously into the engineering practice, this work seeks to demonstrate the principles of the environmental design.

The language of patterns for the design needs was developed and adopted by a significant number of theorists, architects, and urban environment designers, noted in the work [5]. However, this work does not fully reveal steps that need to be done to develop simple source codes for the needs of urban design using pattern theory.

The author of the work [6] concludes with a discussion on the use of VR virtual reality space as an instrumental representation of architectural space in design practice and research contexts. But the question remains as to whether it can be done using control systems, perhaps, based on artificial intelligence.

An alternative solution to the problem, presented in [7], does not provide integrated control systems for the design process. In this article, contemporary approaches to design are discussed through examples to assess the role of spatial components that create optimum interior.

Interesting approach to ED theory at the sensory format demonstrated in work of B. Piga and E. Morello according to studies of urban space [8]. Mention should be made of scientific research that directly affected the theory and concepts of ED. Moreover, when it comes to the development of the theory, it is worth starting its review with the origin and appearance of the first mentions, a brief description or analysis of what has been done by such scientists as. All their achievements must be correctly incorporated into the body of our theory.

Researcher Stuart Rose effectively targets ED theory through spatial relationships studying. In his research [9] the interaction between man and his physical environment was examined from a stimulus-response point of view. Also importantly determines the effect that variations in the qualitative characteristics of a space have upon the behavior of its occupants, who are performing a specified task.

According to the authors of the work [10], the scale provides creative possibilities of rational relations of human body and space. The proposed scale line can contribute to effective possibilities of creating an environment of architecture. Unfortunately, this is not fully confirmed by the principles of mathematics and geometry.

In research [11] deeply presented geometry basis important for ED theory. Also need develop Applied Geometry analytics methods and algorithms, which necessary for architectural design practice development. In next work of this author the relationship of observers and the environment has been shown [12]. Discussion is supported by analysis of developed environments, where understanding human perception plays a role in shaping aesthetic solutions. However, the described settings do not have actual confirmations.

It was considered in [13] that the architectural historian Kenneth Frampton argued that the ontological state of architecture is in poetic terms of the constructural logic of the structure. This position involves a certain structural congestion that resists or reacts to dynamic conditions where all constructed structures ultimately must stand, emphasizing the inaccuracy of the appearance of a form as a continuous intercommunication between the streams of consciousness and materials.

Mention should be made of scientific research that directly affected the theory and concepts of ED. Moreover, when it comes to the development of the theory, it is worth starting its review with the origin and appearance of the first mentions, a brief description or analysis of what has been done by such scientists as R. Wener and N. Elgeneady. In their works, they made a brief overview of the history of our issue [14].

The authors of the work [15] maintain that today's design as a practice and research faces a dramatic change, focusing on "Ways of Thinking and Doing" instead of "Object". In

this context, the mission and vision of the Environmental Design discipline will opt for change accordingly. Furthermore, new constructive ideas, and methods for Environmental Design are also proposed.

The author of the work [16] underlines the importance of the conditions in which people deliberately seek to accept their environment. Then the environmental design means the course of action to stimulate or realize this condition. While this assertion may be considered in some aspect, this article contributes to the formation of a new environment culture, that focuses on the use of a holistic, human centered and interdisciplinary approach to the creation and maintenance of sustainable existence for space as Ecosystem, including experience, communication, and place, where the interactions of people with surroundings will be optimized.

Thus, the results of the analysis allow to conclude that it is necessary to unite efforts to create the general scientific base of the applied environment design theory.

The aim and tasks of research. The study is to combine efforts for universal scientific treatise of ED applied theory creating.

The objectives of the research to achieve the need aim is next.

1. To make analysis of objective environmental space essence.
2. To study of technofact phenomena.
3. To define main principles of theory.

Materials and methods. The research methodology is aimed at determining the axioms, postulates and statements that can form the analytical apparatus for such an applied science. The methods of analysis, modeling, systematization and logic are used in the work.

Results. Constant being development, which defines subject consciousness, requires development necessity of creative relation of last to form of his being. Have a dialectical chain: being – consciousness – being. Design is constructive art. As issue from it let's consider the subject being of constructive creative activity.

The first task of theory of Environmental Design consists in spending of scientific investigations of regularities, and, probably, laws and rules of human being objects arrangement.

Well known, that any theory starts from classification of objects of studying. In our second task need to study sites invariants, first urban agglomerations schemes, well known cities form compositions. Any science first requires exact definitions and terms system classification based on analysis and synthesis methods. Environmental Design as technology is objects, processes and occurrences of human being designing. ED purpose consists in means and conditions human being optimization. ED product is consisting in environmental artifact creating. This purpose today is most wide task. The solution of this problem needs in consolidation efforts of different representatives of science and practice. The approach to such level of task requests to consider many issued factors of real life. Briefly, the structure of Theory of ED, as, probably as any other theories, may to be introducing by such scheme:

- objects classification.
- methods.
- technology.
- means.
- tools.

The third task of Theory of ED creating consists in principles consideration objects placement forming.

Ethics is capital principle of designed environment. It foresees and requires from designer to provide correct approach to design tasks. Ethics forms not only by human

pragmatic requests to environment, but and by spiritual. ED ethics sense consists in human life improvement.

Human being conditions *optimality* is second principle of ED. It defines golden correlation all requests to designed object, thanks to it assists to environment new qualities beginning, before did not discuss with investor.

Third principle – *complexity* of environment defines full valued of his content, gives base to value object as formed organism.

System approach is forth principle, which defines relationship quality of being system elements, her flexibility and opportunity for integration with other systems in different combinations.

Environmental new quality been defined by principle of ED *progressiveness*. Designer's effort to achieve contemporary quality parameters for designed object. Creativity is special form of designer activity. Good creating designer must have excellent seeing and forecasting. Creativity is not only the sum of knowledge – it is special intellect's tendency, special relationship between person's intellectual life and activity force's ability to reveal. Creativity is life's essence in world of knowledges and beauty. Creativity process in own moving gains new qualities, stands more complicated and riches. Creativity continuity relates to time and space continuity.

To create any being means to create form. Although nature «artifacts» more ideal as manmade artifacts, constant human striving to know secrets of this perfection and to surpass them by his activity results, to form being to himself needs is fact. It is stimulation for creative investigation. Human must to study under nature tutor, to apply her experience. As outcome created additional principle – *naturalness* of projects decisions.

What is Theory of Environmental Design? Theory in wide sense is logic-based construction, which yet did not find his total realization. Environmental Design Theory also can have own analytic system because she based on applied geometry – shapes qualities science.

In current time design objects gain form which logically outcome from their content. Connection of practical experience (technique) and scientific knowledge (aesthetics) in designer activity integrates base for receiving need results.

Environmental artifact is creating to satisfy different requirements some customer and must matching to principles of designer activity. The list of customer requirements, as a rule, consists of ethics, ergonomics, serviceability, economic efficiency, energy efficiency, ecology, and aesthetics. To meet these needs, the expert should act on some principles. These principles have been defined above, namely *ethics, optimality, complexity, system approach, progressiveness, and naturalness*.

To start discussing that theory ED is possible to develop as branch of knowledge need as first step accent attention on those fundamentals, which can be acceptable without proofs. Some of them can have next edition based on system logics approach:

Axiom 1: Environment's quality is human being quality:

$$\text{Environment's Quality} = \text{Human Being Quality.} \quad (1)$$

Acceptable without proofs. Because improving the quality of human habitat is the main purpose of the professional activity of an architect or designer in working to improve the material environment of human existence.

Another axiom or postulate is next:

Axiom 2: Two objects relationship is function:

$$(\text{Object } A \leftrightarrow \text{Object } B) \rightarrow \text{Function } AB. \quad (2)$$

Well known that any environment is multifunctional system. From this reason need to find and establish possible minimum of objects relationships as spaced or contented, by

which environmental effect is possible. Can maintain the next, which need substantiation:
Theorem: For environment's effect enough three functions:

$$\left\{ \begin{array}{l} (Object A \leftrightarrow Object B) \rightarrow Function AB \\ (Object B \leftrightarrow Object C) \rightarrow Function BC \\ (Object C \leftrightarrow Object A) \rightarrow Function CA \end{array} \right\} \rightarrow Content ABC. \quad (3)$$

Assume, if it not true. Assume for environment effect enough only one function. As result, we have too objects relationship:

$$((Object A \leftrightarrow Object B) \rightarrow Function AB) \rightarrow Content AB. \quad (4)$$

Existence of two objects A and B and connection AB is mono-functional system AB. It is possible to introduce situation, for example, man or ball in open field (Fig. 1).

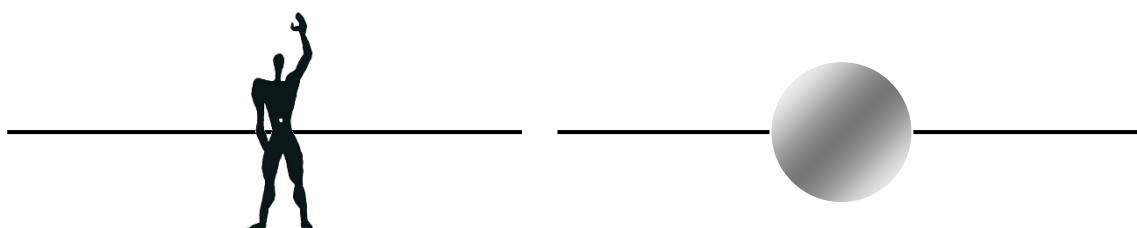


Fig. 1. Single object in space

As we can see at Fig. 1, the environment absented in introduced cases, because it is as if a person finds himself in a boundless desert or in an endless sea.

Well, assume second option that for environments effect enough two functions (Fig. 2):

$$\begin{array}{l} ((Object A \leftrightarrow Object B) \rightarrow Function AB) \rightarrow Content AB, \\ ((Object B \leftrightarrow Object C) \rightarrow Function BC) \rightarrow Content BC. \end{array} \quad (5)$$

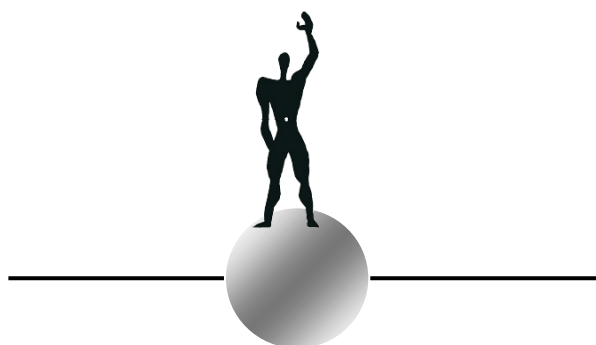


Fig. 2. Three objects by vertical axis

Received result of three objects: field, ball and person placed each on other according to vertical line also not enough to feel environment effect. Next option with three functions (Fig. 3):

$$\left\{ \begin{array}{l} (Object A \leftrightarrow Object B) \rightarrow Function AB \\ (Object B \leftrightarrow Object C) \rightarrow Function BC \\ (Object C \leftrightarrow Object A) \rightarrow Function CA \end{array} \right\} \rightarrow Content ABC. \quad (3)$$

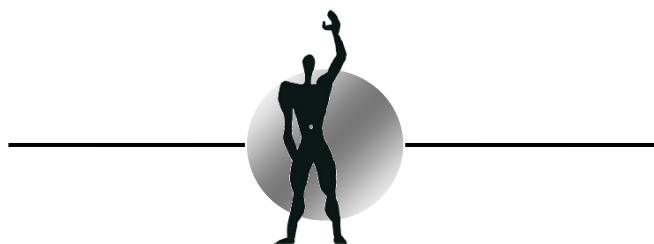


Fig. 3. Three objects triangle

As we can see, environment's effect is present. Theorem proofed. From three functions is possible to set triangle of space relationship. Achieved triangle will introduce content ABC. If will added more functions to it, the environment's effect will stronger. Well known, that by using triangle is possible geometric modeling and describing most complicated shapes, objects, and systems. Possible next axiom:

Axiom 3: Form and Content define Format:

$$(Form \leftrightarrow Content) \rightarrow Format. \quad (6)$$

Yes, really any formats as some foundations consists of form and content. In this connection are possible some definitions, such as: *Format is Contented Form* or *Format is Formed Content*. Possibly, independently maintain next, that format has form and format has content. Term *Unformatted* constants form absence and, therefore, content absence. Object without form, without content has not format and therefore is not artifact – art object or imagined object. Artifact possible as format of form and content together.

Possible next maintain:

Axiom 4: Format defines technofact:

$$((Form \leftrightarrow Content) \rightarrow Format) \rightarrow Technofact. \quad (7)$$

Axiom 5: Technofact defines Habitat:

$$(((Form \leftrightarrow Content) \rightarrow Format) \rightarrow Technofact) \rightarrow Habitat. \quad (8)$$

Axiom 6: Habitat defines Consciousness:

$$((((Form \leftrightarrow Content) \rightarrow Format) \rightarrow Technofact) \rightarrow Habitat) \rightarrow Consciousness \quad (9)$$

First defined and presented in axioms term “Technofact” means any manmade material object as pragmatic functional element for habitat spaced system and as part of environmental useful content.

Probably, that are not all possible maintains and states ED theory. However, it is important, that this theory can be logically exacted, to has own special analytics.

The most significant outcome of this section is to identify six basic principles of environment design. Other, equally important, results are building six axioms and bringing one theorem. Collectively, the conditions for defining an analytical apparat ED theory are created.

It is not possible to compare these results with the results of other researchers as it makes up the content of the *scientific novelty* of this study. In the works of other researchers [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16] similar scientific conclusions are absent. To imagined possible to develop these logic results in the direction where they will have applied importance in the design of the urban habitat. The results will play an important role in the increase in efficiency of practical records meaningful for architecture, urban development, and landscape art.

5. Conclusions

Analysis of objective environmental space essence confirmed opportunities for scientific studies of law measurements for habitat organization.

Understanding of technofact essence created base for decisions all tasks of formats creating in design and architecture.

Six main principles of Environmental Design theory defining create opportunities of their further superstructures and development in dependence from branch of design. Their role and meaning in the practical activities of the designer will be very productive.

And as resume to all research need to constant that Environmental Design theory is possible as strong systematization of collected experience, as knowledge not only theoreticians, but and practices of architecture and design.

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