Critical Thinking for Architects

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Abstract. This paper seeks to define the phenomenon of critical thinking in architects. Architectural thinking in the sphere of architectural theory is critically analysed. Critical components in the structure of architectural thinking are identified. Problem statement. The architectural process is undergoing dynamic changes in Russia. The architectural science appeals to the ontological questions of the profession in an attempt to reconsider professional architectural thinking. The current relevance of the critical approach to architectural professional thinking has been called to life by both practical and theoretical problems in architecture. To be resolved, these problems need effective thinking and activity management. This, in turn, makes it essential to incorporate critical thinking principles into the professional architectural thought, which should open up a way forward to the understanding of critical thinking in architectural theory and practice. Research methods. The paper critically reviews the principal ideas put forward by theorists. Analysis and synthesis is applied to the results of the comparative analysis. Critical analysis of theoretical constructs will be necessary to identify new perspectives on the definition of the critical architectural thinking phenomenon. Main conclusions. The structure and specifics of architectural thinking have been presented, and the distinctive features of critical architectural thinking have been outlined.

1. Introduction

In the Russian Federation, higher architectural education is delivered in accordance with the federal educational standards approved by the federal Ministry of Education. The latter define certain universal competences to be developed in architecture students as a result of completing the educational programs at bachelor and master degree levels. The bachelor degree student should be able «to conduct research and critical analysis and synthesis of information, and apply the systems approach to problem solving» [1], while the master’s degree student should be able «to conduct critical analysis of problem situations based on the systems approach and developed an action strategy» [2]. These universal competences fall under the heading «Systemic and Critical Thinking» in the bachelor and master educational programs. These requirements of the federal educational standards along with the lack of manuals on thinking strategies and tactics for architects have become a reason for turning to «intra-professional» reflections on critical thinking as a phenomenon.

Inner productive criticism and skills to manage one’s own thinking are important components in the professional culture of the modern architect. The systemic character and critique are integral components of architect’s professional thinking. The current importance of a critical approach to studying the thinking of the architect has been caused by the practical and theoretical needs of architecture and problems in the sphere of architectural education. For resolving these problems, the
profession needs skills in effective management of the thinking process and inclusion of principles of critical thinking into architectural activities.

Critical thinking is an integral ability of the architect. This phenomenon is the focus of this study. Once identified and established, the principles of critical thinking will allow us to generate a mechanism for internal organization of professional architectural thinking and integrate them into architecture educational programs at bachelor and master levels. Critical thinking skills will enable a professional architect to effectively manage his/her thinking and, thus, their creativity as a whole.

2. Concepts of architectural thinking
To identify the specific features of the architect’s professional thinking and determine the place of the critical components in it, it is reasonable to review the available spectrum of theoretical ideas on architectural thinking. Analysis of how the phenomenon of architectural thinking is understood by various researchers will allow us to shape a general theoretical picture of architectural thinking which currently exists in modern architectural science.

In their theoretical works, Russian authors have demonstrated various approaches to studying this phenomenon, including the methodological studies of systems thinking activity carried out by G.P. Schedrovitsky, the philosophy of culture developed by A. Losev, works on the theory of information processing, on techniques and algorithms of creative thinking, and on the philosophy of creativity. The writings of B.G. Barkhin, V.I. Iovlev, P.V. Kapustin, and Yu.I. Karmazin address the structural organisation of the architect’s professional thinking from the didactic point of view.

Architectural professional thinking, which has been within the scope of attention of the architecture theorists since the 1960s, became an independent object of research in the early 21st century. To date, the Russian theoretical architectural thought has come up with few but essentially different ideas about how the architect thinks and how they should think.

For ordering the various disparate concepts of architectural thinking, it is reasonable to apply a disciplinary principle. As a result, we can identify three levels of research into professional thinking of the architect as a whole – logical, psychological, and philosophical-methodological.

2.1. Interpretation of architectural thinking according to B.G. Barkhin
The logical level of research into professional thinking of the architect is represented by the concept the concept of B.G. Barkhin, who showed interrelation between the processes of thinking and design methods which, in turn, provides a basis for development of his/her own creative method by the architect. According to B.G. Barkhin, discursive and intuitive thinking are the oppositional components of architectural thinking revealing its dual nature. Each of these components of architectural thinking presents a sequence of steps subordinated to a general principle – alternating motion from the intuitive pole to the discursive one and back [3]. Following B.G. Barkhin’s logic, the structure of architectural thinking is multilayered. However the order of an arrangement of these layers only partly reflects the sequence of thinking processes. The elements of the structure is likely to present just a set of possible means from which an individual model of architectural thinking may be generated.

2.2. Interpretation of architectural thinking according to V.I. Iovlev
We may refer to the psychological level of architectural thinking studies the concept developed by V.I. Iovlev. He gives a lot of attention to studying the essence of the architect’s thinking, in particular, to its categories of space-time and image. The specificity of professional thinking according to V.I. Iovlev consists in three postulates in the consideration of the object of research: as a form of cognition, as an activity and as a part of the social phenomenon. The process of architectural thinking begins when the basic categories of architectural thinking “space-time” and “image” enter into interaction. These categories give rise to the thinking unit – “spatial-temporal image”. The substructure of the unit of thinking, in turn, goes back to the term «architectural chronotope», which is a derivative of the more general spatial and temporal archetypes. However, “the spatial-temporal image” operating as a unit of thinking is not identical to the unit environment at which the creative thinking of the architect is directed. Whereas the structure of the unit of thinking is, conventionally, three-dimensional (space-time-image), the development of the unit environment – «an architectural
environmental field» – involves a fourth dimension, which is «the energy of space-time». Similarly to the previous ones, the substructure of this component reflects a fusion of more general phenomena, spheres of human activity and the sphere of consciousness [4].

2.3. Interpretation of architectural thinking according to A.G.Rappaport and P.V.Kapustin

The approach taken by A.G.Rappaport is essentially distinct from the above ones. Architectural thinking is a phenomenon including spheres or "suborganisms". «First of all, this is design thinking per se, solving functional, planning and engineering tasks. Secondly, this is figurative or artistic thinking connected with the embodiment of architectural plans in the form of images, and, finally, this is regulatory organizational thinking associated with communication between the architect and the customer, authorities, and builders. Above these three spheres of thinking, there are three spheres of other professional organisms of architectural thinking – history, criticism and architectural esthetics. Still above is the theory of architecture and architectural pedagogy. Finally, recently we have seen the emergence of fragments of methodological thinking in architecture and planning» [5]. Each of these spheres is a carrier of its own original set of components inherent only in it, and, at the same time, all of them possess a common essence. This uniting essence is, in Rappaport’s opinion, the architectural form in its aggregation of the morphological, symbolical and phenomenological aspects. The architectural form is the basic category of architectural thinking. All this "many-storied" structure relies on the dual nature of architectural thinking itself, including the scientific and mythical types of thinking.

Unlike A.G.Rappaport, P.V.Kapustin builds a program for developing professional thinking in students around the problem of interaction between various «types of thinking»: design, scientific, engineering, artistic but also philosophical, methodological, mythological and mythopoetic. According to P.V.Kapustin's theory, in the architectural design process, certain types of thinking such as scientific, artistic and engineering prevail at this or that stage of it (pre-design research and information gathering, creative search, creative development, and the final stage) [6].

The concepts of A.G.Rappaport and P.V.Kapustin may be referred to the philosophical-methodological level of professional thinking studying in architects.

2.4. Variety of understandings of architect’s professional thinking

Thus, the architect’s professional thinking can be presented as a model of spatial architectural fields, as a process of development of the author’s credo, as part of the social phenomenon or part of the noosphere. In some cases, architectural thinking is presented as a complex interaction of various types or thinking: discursive and intuitive, scientific and mythological, or design, artistic, engineering and scientific.

3. The phenomenon of critical thinking in the architect

Research into critical thinking as a whole without focusing on the architect’s critical thinking in particular has been pursued by various authors. The disciplinary principle of ordering isolated concepts on architectural thinking could be reasonably used for developing an understanding of critical thinking in architects. The logical-psychological, metacognitive and philosophical-methodological tiers – these are the three levels at which critical thinking may be studied.

3.1. Concepts of critical thinking

The logical-psychological level of critical thinking studies architects may be represented by the concept of Diane Halpern, who summarized the findings of western cognitive psychology and pedagogy. According to her definition, critical thinking is «the use of those cognitive skills or strategies that increase the probability of a desirable outcome» [7].

In spite of the fact that critical thinking is not an object of research for metacognitivists, "metathinking" is one of the major properties of critical thinking. According to J. Flavell, metacognition is an ability to analyze one’s own cognitive strategies or «reflect on thinking», to manage one’s own cognitive activity. “Metacognitive knowledge is that segment of your (a child's, an adult's) stored world knowledge that has to do with people as cognitive creatures and with their diverse cognitive tasks, goals, actions, and experiences” [8].
The philosophical-methodological level of critical thinking study is characteristic of the concepts developed by K. Popper and R. Paul. Critical thinking in K. Popper's understanding presents the first theoretical postulate forming a philosophical basis for understanding an object. Critical thinking, according to K. Popper, is a type of thinking which includes constant verification of assumptions ("theories") and verification of the ones which are erroneous. The will to revealing contradictions (the primary goal of criticism) and their elimination and, through this, approximation to the truth are the driving force of science. “To be effective in bringing about the growth of knowledge, criticism should follow social rules” [9]. R. Paul identified three decisive dimensions of critical thinking: 1) skill of thinking; 2) elements of thought; 3) areas of thought. He defines critical thinking as «self-guided, self-disciplined thinking which attempts to reason at the highest level of quality in a fair-minded way» [10].

Anna Bernstein in her study devoted to the criteria of critical thinking for evaluating online discussion has generalized the components of critical thinking which have been described by such researchers as Hsiao, Chen, & Hu; Mertler; Wegmann, & McCauley; Rezaei & Lovorn; Vandervelde; Cato; Frey; Gilbert; Lynch. The components of critical thinking are: problem identification, clarifying question, logic of argument, evidence/supportive information, synthesis of ideas, references to readings, problem solving [11].

3.2. The specifics of critical architectural thinking
The process of critical thinking implies a stage-by-stage process of analysis of an architectural object or an event in the architectural process. The important factors in it are the subjective value system of the architect and perception of the object or architectural phenomenon. The levels of interactions between the components in the course of critical architectural thinking that we could identify are operational, regulatory and attitudinal. The first level, operational, is characterized by application of cognitive skills and tactics to specific architectural tasks. The second, regulatory, level is characterized by control, adjustment and planning of thinking processes. For the third, attitudinal, level, it is the social, professional and personal reflections of the architect on the role of architecture and his/her place in it that are its characteristic features. The operation of the critical components in the professional thinking of the architect depends on the interaction between the three levels. In solving practical architectural, spatial, planning, and engineering tasks and theoretical research tasks (pre-design conceptual analysis, architectural criticism, pedagogical activities), all three levels operate simultaneously in constant interaction.

4. Conclusions
Thus, the critical thinking of the architect is a complex multi-level set of cognitive and meta-cognitive actions performed by the architect consciously in the course of his/her architectural activity and aimed at overall improvement of performance in creating high-quality original architectural solutions. Critical thinking occupies a key position in the general structure of architectural professional thinking. Based on a review and analysis of various theoretical concepts of architectural thinking, three levels of critical thinking can be identified: logical-psychological, meta-cognitive and philosophical-methodological, which enable its specificity to be determined. The specificity of critical thinking consists in a multi-layered pattern of actions on operational, regulatory and attitudinal levels. The results of this study and further theoretical research into architect's critical thinking will make it possible to raise it to the level pedagogical practice and develop a methodology for inclusion of critical thinking techniques into architecture education programs.

5. References
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