Integral Environment of the Information-oriented Society and Higher School of Architecture as a Field of Design Researches*

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Abstract—**Following the rapidly changing reality of architectural practices, which is largely responsible for the organization of the living environment of modern society, a new type of architectural education is developed throughout the world. It is distinguished by the fundamental nature of project research, social responsibility and a problem-oriented approach to the formulation of professional tasks, the search for new methods for their solution, adaptation to the digital culture of the information era.**

The Moscow Institute of Architecture, following the world trends, implements a program of comprehensive research of the integral environment of information-oriented society in the format of an educational experiment that adapts the traditions of national higher education to the demands of modern times. Digital technologies are considered not only as the main technological base of the modern design process, but also as a factor determining the new methodological basis for design creativity.

The article describes the experience of the Educational and Scientific Center "Architecture and Computer Technologies" of the Moscow Institute of Architecture in teaching students to work in a uniform information field and to targeted use of CT in educational research and design activities.

Keywords—integrated environment of the network society; magistracy; design researches

I. INTRODUCTION

The leading architectural schools all over the world are the centers of current scientific research, which today determine the purpose and semantic content of architectural activity. Issues of environmental ecology, harmonization of relations between nature and a man, social and economic problems of resettlement, issues of history, culture, preservation of heritage and renovation, the use of high-tech equipment, constructions, new building materials and structures.

With the expansion of the boundaries of modern architecture, with the constant increase in the areas of knowledge required for consideration, the task of establishment of interdisciplinary connections between them is increases in the design process. The volumes of information and the need to dive into fairly diverse areas of knowledge would be impossible without the use of modern Information and Communication Technologies (ICT). Just with the ICT development the rapprochement of various fields of knowledge, science and art, humanitarian and technical areas have occurred. The blurring of boundaries between the areas of knowledge and activities that had been divided until recently happened due to the possibility to present information in a uniform digital format.

In the field of architecture, digital technologies are not only the main technological base of the design process, but also a factor determining the new methodology of design creativity. The main features of modern design are: interdisciplinary, the ability to group collaboration (with colleagues and the public), sensitivity to social issues, a focus on the principles of sustainable development and reliance on high technology at all stages of the design process, from concept formation to release of documentation for construction, operation and utilization of the design object.

The physically invisible, but the pervasive and real network of informational communicative component of modern life gives grounds to speak about the integral quality of the environment of information society, about the parallel existence of two realities - actual one and virtual (digital) one.

The network nature of economic, social and cultural relations breaks the traditional hierarchical of attitude and belief systems, built as "vertical of power", priorities of "heads" and unconditional, devoid of initiative and impersonal subordination of "younger" structures.

The process of hierarchies' destruction, or more precisely, the formation of hybrid structures generated by the requirements of network relations, is marked in the field of economics, sociology, politics, management and culture. It is also characteristic to architecture. A strict and logically relevant system of collateral subordination of functionally designated architectural spaces is today turning into a multifunctional, having non-clear spatial boundaries, flexible, and hybrid environment.

The range of problems associated with the deep integration of virtual and relevant realities, with the penetration of ICT into architecture, is constantly expanding. The Magistracy of the Educational and Scientific Center "Architecture and CT", as one of the divisions of the MARCI Magistracy, was organized in 2017 and became an experimental testing ground for mastering the new design methodology that meets the challenges of time.

II. TRENDS IN THE SOCIAL DEVELOPMENT OF THE INFORMATION SOCIETY AND THEIR REFLECTION IN ARCHITECTURE

The entry of society into the new-breed network paradigm is accompanied by an intensive search for theoretical foundations and practical experiments in various fields of science. The results of scientific discoveries in related fields of knowledge allow architectural science to determine the most important areas of research, integrate into the formation of a new picture of social life, and determine the status and significance of project activities. In the changed world picture, the architecture appeals to research in the economy and in the social sphere.

The rapid development of ICT has significantly increased the amount of information. However, according to M. Castells, the main feature of the information or network society is not even the arrays of the information being processed, but the network logic of its use, which makes it possible to receive gains from the ways and formats of its processing [1].

The economic and social sphere of the network society is focused on generating a continuous stream of innovations. Famous economists of our times, such as L. Leidesdorf, G. Itskovitz, M. Porter, F. von Hayek, in Russia: N.A. Smorodinskaya, A.E. Shastitko, I.G. Dezhina, E.A. Kiseleva developed the basics of the new organization of the economic structure of society, requiring development with continuous updating.

As Smorodinskaya noted, "… In the 21st century, vertical structures turned out to be too rigid, and the traditional market model was too atomized to match the parameters of the online environment. Therefore, the world economy began to master the third, network way of coordination of communications and started changing its usual structure into a cluster-network - much more flexible than the hierarchy model, and at the same time more integrated than the market system".

Views on the organization of new governing structures expressed by V. L. Glazychev [2] and M. Castells are evolving. Both scientists in their papers predicted the development of mixed "hybrid" management structures, which combine network organizational principles for solving problems peculiar to grassroots open communities and the work of autocratic hierarchical organizations that are focused on supporting and promoting grassroots social initiatives. The main role should be played by network organizations that carry out their activities through numerous horizontal business relations on the principle of collaboration (coordination of actions without hierarchy). Only in this way it is possible to connect and direct into a single channel of development the "space of flows" aimed at the world globalization and the "space of places" designed to preserve the identity of individual territorial entities.

A. E. Shastitko considers a cluster-based network economics as a system of flexible temporary agreements, where participants retain legal independence with full or partial pooling of resources, information, and activity concepts. Clusters that represent a hybrid structure characteristic of a network society occupy an intermediate position between the market and the hierarchy, and are the main structural link in the global economic space [3]. According to F. Hayek's economic theory, cooperation is the basis for the emergence of innovations. Today, communications and interactions of three or more players are coming to the fore with the participation of power structures and on the basis of attracting of scientific developments. The benefit is obtained at the highest rate of introduction of innovative schemes, algorithms of actions, scientific discoveries, etc.

In Russia, for the time being, double contacts with the command function of the state continue to dominate, although the desire to organize horizontal ties has already been established and enshrined in law. It is necessary to create the movement "from below" — the social activity of citizens on the ground, which can become a key element of development. "The movement towards innovation begins not with the newest production technologies, but with advanced social approaches, with the creation of a common favorable environment for the emergence of initiative cluster partnerships in each region." [4] The development of a new economics is accompanied by an active socialization of all areas of activity, including architecture [5].

The actualization of sociological researches - the search for an information model of the interaction of an architect with basic social competences in the field of architecture is marked by a keen interest in "environment-behavior research". In this area of interdisciplinary cooperation of architects, city planners, designers with sociologists, psychologists, ecologists and physicians, architecture plays a special synthesizing role. The subjects of the study are: the visual perception of the city, behavioral reactions to the environment; criteria for assessing environmental qualities

are developed, the lifestyle of the urban population, various social groups and minorities is studied [6].

III. ICT IN THE NETWORK SOCIETY ARCHITECTURE

With the advent of ICT in architecture, it became possible to create an environment and individual structures of a high level of complexity, which corresponds to modern ideas about the complexity of the organization, the "rhizomebility" of the world around us. The art of integrated use of conceptual, physical and mathematical modeling expanded the boundaries and deepened the content of the design process, which is directly dependent on the state of a uniform information and communication platform of the entire network society.

The tendency to integrate various types of art and merge them with architecture on a uniform ICT platform generate a creative space that contributes to the manifestation of civic activity of the population, its participation in shaping the subject-spatial environment together with professionals, raising the cultural level of all sectors of society [7].

The architecture of our days is updated in the context of a hybrid and open "real virtuality", it is permeated with a new world outlook, being part of the digital culture of a networked society, and sensitively responding to the challenges of time — expanding its boundaries, opens to nature and a man, becomes responsive and interactive.

The technological platform of design practice has become BIM technologies (Building Information Modeling), in which the integration of digital data of any complexity with the geometric model of an architectural structure took place. Separate, previously differentiated, operations were closed and became a uniform process. In fact, the architect works in the uniform field of information and computer modeling.

In contrast to the generally accepted attitude towards BIM, as a technology that defines strict design regulations that dictate ready-made action algorithms, the authors of this article rely on a broader understanding of information modeling, including BIM-environment as a field of interdisciplinary research, allowing developing new action algorithms. Each of the adjacent areas has a lot of groundwork, arrays of knowledge, and the specifics of the logic of work. It is necessary to find ways to bring them together in a single workflow. In this situation, BIM serves as a developing scientific environment, where processes of effective information exchange are formalized.

BIM technology is a multi-level process in which there exists in parallel: the technology itself for performing design works and the scientific field of knowledge, which feeds and develops technological procedures. The higher education institution as an educational structure relates to both sides of the process. It is associated with practice, because it receives an order from practice for the level of graduate training. An institutional science is part of the scientific and experimental base on which technologies are developed and improved [8], [9].

Architectural education is an essential aspect of the formation and development of BIM-environment. Without introducing of advanced design methods in schools and without developing the foundations of an integrated knowledge environment necessary for the design process, it loses the real field of experiment and an additional research base. Not to mention the fact that the future architect is unthinkable today without grasping of digital project tools and group work skills in the BIM environment.

IV. MAGISTRACY OF EDUCATIONAL AND SCIENTIFIC CENTER "ARCHITECTURE AND COMPUTER TECHNOLOGIES"

Introduction of the master's degree level in 07.04.01 — ARCHITECTURE at the Educational and Scientific Center "Architecture and Computer Technologies" (A&CT) of MARCI in 2017 expanded the design and research work of students using modern digital tools. The formation of the magistracy was accompanied by the introduction of new disciplines and the development of methods of design research.

The main profile directions of dissertation research have been formed: the study of the high-tech environment of modern architecture, its multimedia component, the development of techniques for using ICT in design at its various stages, the study of the Digital Culture phenomenon. The pace of technology development makes it necessary to quickly respond to innovations in this field and find ways to integrate them into the educational process; therefore many innovations are experimental or take place in the format of master classes.

The need for high informational richness of the material, the creative nature of training with the involvement of multidisciplinary specialists, as well as the tasks to achieve a high level of professional competence inherent in the educational process in the magistracy, have significantly expanded the scope of training and focus on the research component of project activities [10].

The specifics of the training of undergraduates at the Educational and Scientific Center A&CT are determined by its subject field — the theoretical and practical components of the problems of architecture solved by ICT means. The subject of research is digital modeling and programming elements in the theory and practice of architecture.

"Architectural research as a new form of professional activity has been forming since the 1960s. In the same years, a special type of design studio — the research one — appears. And this is not only about the involvement of scientific knowledge in the project process. In the English-speaking countries, since the time of the first edition of the famous book by John Zeisel "Inquiry by Design", the tradition to treat design itself as a method of research has been developed and is developing now" [11].

The study of the methodology of current architecture by foreign theorists and practitioners began in the 80s of the twentieth century and continues to this day, as rapidly developing technologies entail methodological changes. The implementation of the Master's program of the Educational

and Scientific Center A&CT is able to make both a practical and theoretical contribution to the formation of domestic developments in this direction.

One of the tasks of the magistracy is to orient students in a variety of digital tools, to train the ability of critical evaluation of the software packages capabilities, to select the most effective way to solve a design task. The Master's program is designed for certified architects who are able to independently choose one of the areas of research, taking into account their aptitudes and previous training. It is allowed to build individual lines of the educational process for each student.

V. CONCLUSION

The worldview of the modern architect is formed in the context of the revision, reassessment of traditional attitudes and professional values. Under the conditions of paradigm shift, the format of the project experiment becomes especially relevant, because it is aimed at mastering new methods for solving the original issues of architectural activity for adapting the newly created environment to the natural conditions of the planet.

High School of Architecture is an ideal environment for experimental design, for creating conditions for studying of intellectual and physical modeling tools. A significant factor in the success of training is the participation of students in scientific researches of real architectural practice in solving the most hot-button issues of concern in the modern world.

Moscow Institute of Architecture is known for its commitment to the traditions of the academic school. Both strengths and weaknesses of this situation are obvious. The cult of the artistic, compositional approach to the Project, as a product of learning activities, often turns to the detriment of its analytical, research component. As regards the formation of a scientifically based project concept at the stage of pre-project research, the national high school is noticeably lagging behind the experience of recognized leaders of higher architectural education in the world: Europe, Asia, America, Australia and Africa.

The Magistracy Division of the Educational and Scientific Center A&CT performs the mission of adapting the national higher school of architecture to the conditions of the information society. The Educational Center follows the path of developing of innovative education programs for the complex use of conceptual, physical and mathematical modeling in an integrated environment of interdisciplinary researches, which is as a source for providing a professional education of an architect with a wide range of ICT.

The conceptual installation of the Master's program is the unification of scientific, the technical and artistic ways of understanding the world, the preservation of the best traditions of national architectural education in the context of a new digital culture. Such an approach determines the meaningfulness, efficiency and uniqueness of the architectural activity that is able to revive the spiritual and meaningful qualities of the life environment.

REFERENCES

[1] M. Castells, Information Era: Economy, Society and Culture (Informatsionnaia epokha: ekonomika, obshchestvo i kul'tura), transl. from English by O.I. Shkaratan. Moscow, SU HSE, 2000. [Online resource]. Access mode: http://www.sd-inform.org/upload/books/Politologija/Social-liberalizm/_studyguides_Kastel.pdf [In Russian].

[2] O. I. Genisaretsky and V. L. Glazychev, Formation of local government and civil society in Russia (Stanovlenie mestnogo samoupravleniia i grazhdanskogo obshchestva v Rossii), in City Administration (Gorodskoe upravlenie), no. 5 (13). 1997, pp. 2-10. [Online resource]. Access mode: http://www.emsu.ru/um/default.asp?god=1997&nom=5 [In Russian]. (date of the application: 23.11.2018).

[3] A. E. Shastitko, New institutional economic theory (Novaia institutsional'naia ekonomicheskaia teoriia), 3rd ed., updated and revised. Moscow, Economic Faculty of Moscow State University, TEIS, 2002, p.591 [In Russian].

[4] Ibid.

[5] E. B. Barchugova and N.A. Rochegova, Sociology of architecture. Three stages of development (Sotsiologiia arkhitektury. Tri etapa razvitiia), in Architecture and Modern Information Technologies (Arkhitektura i sovremennye informatsionnye tekhnologii), no.3 (44). 2018, pp.377-391 [Online resource]. Access mode: http://marhi.ru/AMIT/2018/3kvart18/PDF/23_barchugova_rochegova.pdf [In Russian].

[6] K. B. Kiyanenko, Architectural Science in the USA: EDRA and Human-Oriented Studies (Arkhitekturnaia nauka v SShA: "EDRA' i chelovekooritirovannye issledovaniia), in Academia. Architecture and construction (Academia. Arkhitektura i stroitel'stvo), no.1. 2011, pp. 38-43 [In Russian].

[7] N. A. Rochegova and E.V. Barchugova, Contemporary design creativity and its reflection in the practice of the higher school of architecture (Sovremennoe proektnoe tvorchestvo i ego otrazhenie v praktike vysshei arkhitekturnoi shkoly), in Modern architecture of the world (Sovremennaia arkhitektura mira), issue 7, Ed. by N.A. Konovalova. Moscow - Saint Petersburg, Nestor-History publ., 2016, pp. 187-201 [In Russian].

[8] E. B. Barchugova and N.A. Rochegova, Dynamics of ICT Development in the Practice of Architecture and Educational Design (Dinamika razvitiia IKT v praktike arkhitektury i uchebnom proektirovanii), in Architectural and Modern Information Technologies (Arkhitektura i sovremennye informatsionnye tekhnologii), no. 3 (40). 2017, pp. 304-321 [Online resource]. Access mode: http://www.marhi.ru/AMIT/2017/3kvart17/PDF/22_barchugova-rochegova.pdf [In Russian].

[9] E. B. Barchugova and N.A. Rochegova, Modern trends in social development and their reflection in architecture (Sovremennye tendentsii obshchestvennogo razvitiia i ikh otrazhenie v arkhitekture), in Architecture and Modern Information Technologies (Arkhitektura i sovremennye informatsionnye tekhnologii), no. 4 (45). 2018, pp. 145-158 [Online resource]. Access mode: http://marhi.ru/AMIT/2018/4kvart18/09_barchugova/index.php [In Russian].

[10] N. A. Rochegova, Information and communication technologies of architectural design - the core direction in the MARKhI Master's Degree (Informatsionno-kommunikatsionnye tekhnologii arkhitekturnogo proektirovaniia – profil'noe napravlenie v magistrature MARKhI), in Science, education and experimental design in MARKhI: Abstracts of the international scientific-practical conference of the faculty, young scientists and students (Tezisy dokladov mezhdunarodnoi nauchno-prakticheskoi konferentsii, professorsko-prepodavatel'skogo sostava, molodykh uchenykh i studentov), vol. 2. Moscow, MARKhI, 2018, p. 311[In Russian].

[11] K. B. Kiyanenko, Architectural education as an object of academic research and reflection (Arkhitekturnoe obrazovanie kak ob"ekt akademicheskikh issledovanii i refleksii), in Academia. Architecture and construction of Russia (Academia. Arkhitektura i stroitel'stvo Rossii), no. 2. 2017 [In Russian].