The Grounds of Subject Area of Technosphere Studies

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Abstract. In this article we have made an attempt to comprehend the subject area of technosphere studies. First of all, with these purposes there was carried out the methodological analysis of the basic concepts, principles and notions of technosphere knowledge existing in the modern scientific literature; critical assessment is given. On this basis we suggest new structure of the subject area grounds and object of cognition as a criterion of determination of the subject of technosphere knowledge and its structure. For this there was applied the principle of unity of the cognition subject and object as a criterion of determination of technosphere knowledge subject and its structure. Then it’s created a picture of technosphere reality and its fundamental and general scientific principles and notions are formed: technosphere, technology, technosphere evolution, technosphere and technical activities, technosphere safety, technosphere ecology etc. The system model of the subject area of technosphere studies is constructed on such a methodological base.

1. Introduction

The modern epoch is characterized by powerful development of scientific and technical progress. This progress literally embraces all the aspects and phenomena of the human society having not only positive influence on it but also the negative. Therefore, the sciences of technosphere reality have special scientific and educational interest, methodological difficulty and social and cultural value. The most important place among them is occupied by the problem of determination of the grounds of the technosphere studies subject area. With these goals in the modern technosphere studies it’s necessary to use special cognition methods. In our opinion, such way of methodological grounds of technosphere knowledge subject area construction is, primarily, the method of system analysis. At the same time, the system approach to the study of the technosphere sciences subject area allows us to better reveal and reason technospherology as the system of theoretical knowledge.

The construction of the grounds of the modern technosphere studies subject area is connected with the inclusion of the following system-forming elements and principles in them, namely: the principle of the unity of the object and the subject as the main link in the cognition of the technosphere; the principle of reconstructing the system model of the subject of technosphere knowledge and its structure; the principle of forming of a picture of the technosphere reality, its structure and functions.

In the basis of the modern subject area of technosphere studies there is, primarily, general-theoretical principle of the scientific cognition object and subject unity.
2. Theoretical part

In general-theoretical and methodological senses the nature of any science, including technospherology, is determined by the object of its study. Therefore, an important objective of the system analysis of the modern science is the commonness and difference of the object and subject of their study [1]. At the same time, the object of science means the part, the kind, the level of organization, the form of the movement of matter (soil, biogeocoenosis, geosphere, ecosphere, technosphere, society, man, culture, etc.) to which the person's actively cognitive activity is directed. The subject matter of science reflects the main, essential properties, attributes of the object, obtained as a result of the cognitive-practical activity of the subject (person). The object and subject of scientific study are organically linked, mutually complement each other. However, there are certain distinctions between the object and the subject of scientific knowledge. The main structural difference between the object and the object of its study is that only the main, essential properties, features and processes of the object of cognition are included into the science subject.

The interpretations of object and subject and their interrelation in the process of scientific cognition developed in the modern science, are necessary to apply to the study of our specific problem — to reveal the sense and content of object and subject of technosphere studies.

Thus, the common object of technosphere research is the technosphere reality, which includes the following elements, parts, types, forms, levels of organization: technology, technical systems, technical levels of the organization, technology, technical (technosphere) activity, technological and technosphere forms of matter movement etc. At the same time, the methodological basis for studying of the technosphere reality is the principle of objectivity, which allows us to more fully and more deeply comprehend the object technosphere world as a self-organizational and self-developing systemic education, and also allows to lay a more solid foundation for building of an integral model of the subject of modern science about the technosphere.

Technosphere world of the society is the "second nature", "humanized nature" or artificial medium of human habitation. An important element of technosphere world is technology development from the stone axe to the modern computers, nuclear (hadron) accelerators (colliders), spaceships and many other varieties of technical inventions results. All these are the objects of technosphere cognition. At the same time the main object of the modern technosphere studies is technical world or technical reality.

What is the technology from the point of view of the modern the philosophy of technology and science of technology?

Technology from Greek means art and skill. In the modern interpretation the technology is complex socio-natural formation. Therefore, the technology is represented by rather big number of meanings and interpretations [2, 3].

Thus, in modern science, technology is mainly understood as an artificial material environment of human activity, a contradictory unity of forces: natural and artificially created by human activity. At the same time, the objective signs of technology are the following: technology is an artificial, human-made phenomenon; material formation, a mean of human activity, an instrument of his diverse work (shovel and machine tool, car and X-ray machine, pen and camera, iron and rocket, etc.). At the present time, technical systems have been created and have the following typological functions: compensation and replenishing of the limitations and deficiencies of a person (bodily, sensual, intellectual); increase of functional possibilities (reflective, fixative), transformative, transmitting (transferring), preserving (storage); substantially-substrate properties (as the main ones) of technical systems (material, energetic and informational).

3. Practical part

In the modern science and research developments we can also mark out and reason the series of important and specific aspects existing and functioning technical objects [4]. First of all, this instrumental aspect in the study of technology representing the totality of artificially created material means of expedient human activity. The varied forms of this activity generated different types of
technology – industrial and manufacturing, agricultural, medical, military, cosmic, domestic etc. Secondly, under the technology anthropological aspect means creative activity of people directed to the transformation of the nature with a purpose to satisfy the diversity of vital and necessary need of a person (individual and public needs).

Various types of technical activity, functions and specific features of one of the types of this activity - engineering labor are expressed in this aspect. Thirdly, the epistemological aspect of technology means otherness, as well the materialization of technical knowledge. However, from the three factors involved in technical progress - matter (material), energy and knowledge, it is knowledge that plays the main role. As the knowledge of people is improved on the basis of their creative use, more and more effective ways of interrelation and interaction with the surrounding natural and social world are found. Fourth, the socio-cultural aspect of technology is an important element in the development of society and culture. Its functioning and development is largely determined by socio-cultural conditions and factors. The impact of technology on the society is especially amplified in the modern world. Modern scientific and technological progress includes new types of technology: a system of automatic machines and robots, biotechnologies and computers. The technical potential of the society corrects the development of science and education, economics and social life, politics and spiritual life. However, this correction is refracted through a complex system of social relations. Perfection, qualitative change of social relations in many respects were connected with the historical development of technical progress.

An important object of the modern technosphere technologies is a technology [4]. In the first wide insight, a technology is a totality of operations on the purposeful use of technique. In this general theoretical aspect, the technology is a complex material process of technical studies. In the functional relation the technology provides certain conquests of civilization which are the sphere of purposeful efforts, stipulated by the natural and social and cultural factors. The second understanding of the technology is connected with the way of interaction between man and nature, use of machinery and set and sequence of technical operations, determined by the character of technical means in the process of production of technical objects, necessary for the satisfaction of personal and public needs of people. And, finally, the third understanding of the technology as the way of studying of scientific and educational disciplines based on the marking out and reasoning of general principles and provisions of the development of educational programs, methods and technologies.

What relations do the technique and technology have?

For the technique and technology, there are parameters of both generality and differences. On the one hand, technology is naturally connected with technology, where they interact with each other. The creative intellectual forces of man are materialized or objectified in the technology. However, in order to give it activity and activity, an equally important other human force is needed, namely, the use of technology by man. That's why technology researchers sometimes call the material the "soul" of technology. On the other hand, for the technique and technology, the parameters of their differences are inherent. So, in contrast to technology, technique is a set of artificially created means of human activity. Technique includes all material means of natural world laws produced by the society. It is a part of technical reality. Moreover, the technique is an instrument of the culture, mean of the transformation of reality into the adapted environment for the preservation and survival of the humanity in it.

Consequently, technical world is a world of humanity in its technical dimension, degree and level of its ability to serve a mean for the achievement of the set goals and objectives.

In recent times different forms and types of technosphere existence began to appear in the scientific use and even function in our literature.

Here we are talking primarily about the ambiguous interpretation of the technosphere. Thus, some authors consider the technosphere to be part of the biosphere transformed by man [5, 6], the others represent the technosphere as part of the environmental reality and on this basis put it in dependence on environmental studies [7], the third ones - identify the technosphere with all the combined human activities in the transformation of the biosphere, as well as the geosphere of our planet throughout the
history of the development of the mankind [8, 9], the fourth ones - consider the technosphere as one of the areas of artificial reality, namely, the achievements of the results of all human activity during the millennium of its existence in the sphere of technical interaction of people with the material world [10].

Modern science has other attitudes of the authors, connecting technosphere with urban sphere as naturally anthropological system being a complex combination of natural, technical and architectural forms with special geographic space mastered and being mastered by the town-planning [3;14] or with the safety of life-sustaining activity in the technosphere, safety of the natural environment from the negative influence of technosphere [2], or with noxosphere as socio-natural environment bearing very dangerous conditions for life-sustaining activity of people [10]. More extended interpretation of the technosphere as complex system of interrelations of nature, society, technics, man and information is suggested in the modern literature. In recent times in the the philosophy of technology it's made an attempt to mark out and reason new form of the movement, namely technological form of the matter movement.

In general, the common theoretical and methodological analysis of the main objects of technosphere studies identified in the modern literature allows us to conclude that the scientists have made a significant creative contribution to the development of this scientific problem. However, it should be also noted that in the listed author's attitudes there is not yet a clear unambiguous understanding of the technosphere as the main object of scientific knowledge, the powerful methodological potential of the system approach has not been sufficiently implemented in their studies of the technosphere. Therefore, from the position of the system approach, it seems to us that the technosphere can be more fully and more deeply represented as a special integrated formation, parts of which can be technology, technological systems, technological form of the matter movement, technological (technosphere) activity, technological information, technological cybernetics, urban sphere, ecotechnosphere ,nanosphere, technosphere security, etc. All of the objects of technosphere research mentioned above are organically linked to each other, forming a special system model of technosphere world.

Determination of technosphere reality and its structure as an object of technical studies allows as also to lay a solid basement for the construction of integral model of the subject of the modern science about technosphere world.

What is the subject of technosphere knowledge?

The subject of the technosphere knowledge reflects the contradictory unity of the natural and artificial in the objects of the technosphere research, providing the technical activity of people. At the same time, the "naturalness" of objects of technosphere research is determined as the result of their creation from natural material. The "artificiality" of the objects of technosphere cognition is determined by the product (result) of human activity. Functioning of technosphere objects is expressed through the forms of manifestation of a particular law. Technosphere human activity is an important object of the technosphere study. It is precisely the unity, the contradictory interaction of the "natural", "artificial" and technical activity of man that determines the meaning and essence of the subject of technosphere knowledge.

Technosphere science is an integral theoretical system of knowledge that reflects the design, construction, functioning and development of artificially created means of expedient and purposeful activity of people. The formation of technosphere knowledge goes back to the deep past and is connected with the development of people's labor activity, in the course of which not only substance and energy were used, but also knowledge of the ways of transforming natural phenomena and processes into sociocultural values. As the work of the person improved, his technical knowledge was enriched, he entered into ever greater contact with science without losing his specifics. A feature of modern technosphere knowledge is its division into the design and technological, the predominance of empirical knowledge over the theoretical, the functioning of knowledge not only in the subjective but also in the embodied form, and finally, the terminological strictness and specific methods of knowledge fixing - graphs, charts, drawings, standards, technological models, etc. The structure of
modern technosphere knowledge includes the following sections: empirical and technical and engineering. In the conditions of computerization of production, the share of scientific and technical knowledge becomes predominant. Modern science distinguishes such levels of scientific and technical knowledge: the empirical, theoretical and supra-theoretical levels of technosphere knowledge.

The modern technosphere science faces such general theoretical and methodological objectives – to find out what are the subject and structure of the technosphere knowledge. Such analysis of the scientific subject about the technosphere is connected with reconstruction of the subject in its integrity and systemacy. In this sense the subject of technosphere science has complex structure.

The structure of modern technosphere science includes such basic scientific areas: sciences that study the regularities of technical phenomena and macro-level processes (mechanics, electromechanics, urban ecology, technosphere security, ecosphere of the technosphere, life safety, noxology, etc.); sciences, exploring technosphere phenomena and mega-level processes (space mechanics, cosmonautics, etc.); sciences that study the laws of the microworld associated with the study of intra-atomic and intranuclear phenomena and processes and use the cognitive apparatus of microphysics and microchemistry (quantum mechanics, quantum electrodynamics, quantum chemistry, etc.).

The methodological analysis of the considered separate concepts and theories of technosphere knowledge is of course requires scientific and theoretical synthesis, their unification in sole integral system of knowledge – theoretical technospherology. At the same time, unification and generalizing function in any modern fundamental science, including, the technospherology, is carried out by scientific world picture as logical structure of interrelated general scientific, generic concepts and scientific principles [11]. Therefore, in the modern technology philosophy and technospherology, the most important and poorly developed problem is a problem of creation of technosphere world picture. Nevertheless, in the modern science it expected certain tendency of creating of technosphere world picture (technical, technological) [8].

The technospherere picture of the world or the picture of the technosphere reality acts as a special super-theoretic level, the highest synthesis of theoretical knowledge in the sciences of the technosphere. Its logical structure includes a number of fundamental concepts, principles and concepts of technosphere knowledge, namely: technology as a whole formation, which is a collection of artificially created material means of people's expedient activity; technosphere development as a process of replacing human labor with the work of a machine in order to increase human freedom, as a process of qualitative, fundamental changes in the technical basis, the means of production of society; technology as a way of interaction between man and nature, use of technology, set and sequence of operations, determined by the nature of the technical means in the process of production of technosphere (technical) facilities necessary to meet the personal and social needs of people; technosphere or technical (engineering) activity as a system of scientific and technological activity of people, aimed at applying scientific and production-technical experience to create technical devices and technologies.

This is brief characteristics of general scientific and generic concepts and principles of technosphere reality picture. All of them are naturally connected with each other and form particular logical structure of the technosphere reality picture as the highest synthesis of technical knowledge. In methodological aspect the technosphere reality picture acts as a style of technical, design and engineering thinking and is the main reason of the strategy and program of technosphere and technical study.

In conclusion it's important to note the following methodological goals and objectives the solution of which will contribute to the further improvement of technosphere sciences and engineering activity. First of all, this is carrying out of professional (methodological) introspection of ideas, language means and ways of work of the specialists in the sphere of technosphere sciences and engineering activity; secondly, forming of world outlook grounds for different goals and objectives (of professional awareness, methodological study of technosphere sciences, technical education etc); thirdly, study of organization, functioning and development (evolution) of technosphere and
engineering activity in the socio-cultural dimension in the context of human civilization development; in the fourth place, carrying out of deep substantial philosophy and methodological analysis of special (specific) scientific and technical disciplines, namely, their connection with engineering activity, social and humanitarian and natural sciences, including mathematical knowledge; their structure, organization and functioning, appearance and development and also socio-cultural conditions of their existence (dynamics of engineering and technical community, presence of scientific and technical schools and communities, issues of scientific and technical creativity, connection of theoretical and methodological studies in the technosphere sciences with qualified preparation of engineers etc.; the fifth, the further study of technosphere and technical theories of both traditional classical and modern (nonclassical and post-nonclassical) areas of scientific and technical knowledge (energynomics, system engineering, programming theory, reliability theory, engineering ecology, engineering ethics and psychology, sociology of technology, and so on) with the development purpose of system-methodological models of technosphere and technical theories and their further adjustments, improvement and development. Of course, the solution of these problems involves different ways of technosphere study objects overview. Therefore, on the one hand, a clearer differentiation of research in this field of knowledge is required, and on the other hand, it is also necessary to enter a new, higher methodological level, namely, the level of a special targeted program development for comprehensive study of sciences and engineering activities, coordination of work not only science scholars, sociologists of science, historians of science and technology, philosophers, but also specialists with direct experience in science, technical and technological activities.

4. Conclusions
Thus, the development of system grounds of the modern technosphere studies subject area is of significant methodological interest not only for the better understanding of the problem of relation of technosphere knowledge object and subject, determination of subject of technospherology and its structure and also for deeper comprehension of methodological ways of formation of its highest, overtheoretical generalization and systematization – a picture of technosphere reality and for the further improvement and development of general-theoretical apparatus of technosphere philosophy and technospherology, including their effective and rational use in the scientific cognition of complex phenomena and processes of technosphere world.

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