

УДК 101.1+001.12

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THE PHILOSOPHICAL DISCOURSE OF CONVERGENT TECHNOLOGIES IN MODERN SOCIETY

The main idea of the article is to disclose the intension and content «convergent technologies». It is proved, that the convergent development of NBICS-technologies is the new stage of the fusion scientific knowledge, which is formed modern objects of perfection and activity in principle including physical, chemical, biological, psychological, technical, social multipliers.

It is carried out an analysis of the basic processes occurring in society against the backdrop of development and deployment of the convergent technologies. The principles of interdisciplinarity, interdependence and interpenetration of NBICS-technologies content have revealed.

It is emphasize d that humanity as a result of the explosive nature of modern scientific and technological revolution, where global NBICS-technology ge t to occupy a n important place, had approached a new stage in civilization development.

Keywords: NBICS, convergence, technology, nano- bio-, info-, socio-, cognotechnologies, singularity.

Introduction. It is hard to find someone who has not yet heard that the XXI century will be marked by genetics, bio-, nano-, information-, cogno-, social technologies, and artificial intelligence. However, the main feature of modern development comprehension convergent technologies is the emergence of a broad public and scientific interest to the problems of assessment of the social, environmental, ethical and cultural implications of new technologies, which becomes a strict requirement of the developed countries.

Analysis of recent researches and publications. The problem of our research is interdisciplinary in nature, which required an analysis of research in various fields of science that affect one or another important aspect of this problem. The most fundamental level of research into the problems of convergent technologies is presented in the works of V. Balabanov, E. Drexler, E. Zhukov, V. Inozemtsev, M. Kayku, M. Castels, V. Knyazeva, N. Kobayashi, S. Lem, V. Lukyanets, D. Medvedev, N. Moiseev, A. Nazaretyan, J. Nesbit, F. Owens, C. Poole, W. Pride, M. Ratner, F. Fukuyama and others. And it was established that in modern philosophical literature there are no studies on the holistic analysis of the problem.

The purpose and objective of research is analysis of theoretical and methodological approaches to the disclosure of the essence and content of concept of «convergent technology» in modern society.

Statement of the main material. The concept of convergence (from Latin: converge – getting closer, converging) is multifaceted, therefore it requires interdisciplinary discourse. At present, it occurs in the use of different sciences: natural sciences, social and humanitarian.

Convergence means not only mutual influence, but also the mutual penetration of technologies, when the boundaries between individual technologies are erased, and many results arise precisely in the framework of interdisciplinary work at the junction of areas.

Convergence has the character of chance and, as a result, arises spontaneously in different areas of society, as an example, science, technology, education. Due to the occurrence of convergence, a special phenomenon of «techno science» arises, which manifests itself in the fusion of science and technological applications. Such convergence is a new, special form of interaction of some individual objects within the same field of activity, as an example is the convergence of scientific disciplines or the convergence of technologies.

These technologies not only possess self-regulation, but mainly include technologies, most of the stages of creation of which are based on self-organizing technologies that arose only in the second half of the 20th century.

The term NBIC – convergence sounded in 2002 under the auspices of the National Science Foundation of the USA, in a report, «Converging technologies for improving human nature», its authors are American scientists Mihail Roco and William Bainbridge [16]. In the work, NBIC-convergence was characterized as a process of accelerating scientific and technological progress due to the mutual influence of different areas of science – nanotechnology, biotechnology, information and cognitive technologies (N - nano; B - bio; I - info; C - cognitively), its role in the general course of the technological development of world civilization was also revealed.

Humanitarian response to the above listed American project became human technical transformations European approach, which is displayed in the model: the Nano-Bio-Info-Cogno-Socio-Anthro-Philo-Geo-Eco-Urbo-Orbo-Macro-Micro-Nano. It is revealed in the WiCC project «Expansion of the circles of Convergence» [12, p. 101]. The complex name of the project shows that the problems of such a convergence of technologies will require knowledge and specialists in a significant field of science, such as nanoscience, biology, information science, cognitology, sociology, anthropology, philology, geology, ecology, sociology, anthropology, philosophy, economics, etc.

According to the opinion of the authors of this to conception, this form has catalytic effect on technological arsenal of many scientific and practical disciplines, leading to emerged new applied sciences, the main content of which is the study of inter-system effects and emergent properties, appearing at an interdisciplinary association of systems of different physical and informational nature.

V. Pride and D. Medvedev note that the phenomenon of NBIC-convergence, which is developing before our eyes, represents a radically new stage in scientific and technological progress. The distinctive features of this phenomenon, in their opinion, are: intensive interaction between the indicated scientific and technological fields; significant synergistic effect; the breadth of coverage of the subject areas under consideration and subject to influence – from the atomic level of matter to intelligent systems; the identification of the prospects for the qualitative growth of technological capabilities of individual and social development of man. At the same time such technological possibilities entail for a serious cultural, philosophical and social upheaval, forcing to reconsider the traditional view of these fundamental concepts, like life, mind, nature, people, the existence [11, p. 104].

Thanks to the convergence of these technologies, new interdisciplinary areas begin to emerge and develop, such as transhumanism, immortalism, the concept of post-human society. In connection with this, serious cultural and social shifts and restructuring of all spheres of human life and activity are taking place.

Thus, it can be said that technology complex NBICS-convergence become key concepts of XXI century. What is their essence?

The first component of this structure is «*nanotechnology*» and «*nanoscience*». For these concepts, there are no comprehensive definitions. Nanoworld contains the two types of objects – individual parts and structures, typical dimensions are measured in nanometers ($1 \text{ nm} = 10^{-9} \text{ m} = 10^{-6} \text{ mm} = 10^{-3} \text{ microns}$). The decimal prefix «nano-» itself comes from the Greek word *νανος* – «dwarf» and means one billionth part of something.

Nanotechnology is an interdisciplinary field of science that studies the laws of physicochemical processes in spatial regions of nanometer sizes in order to control individual atoms, molecules, molecular systems to create new molecules, nanostructures, nanodevices and materials with special physical, chemical and biological properties.

The application, results and consequences of the introduction of nanotechnology is being studied by nanoscience. Summarizing the opinion of most experts, nanoscience can be defined as a body of knowledge about the structure and behavior of a substance on a nanometer scale, and nanotechnology as

the art of creating and using objects and structures with characteristic sizes ranging from atomic to ~ 100 nm (although would be in one of three dimensions). This definition is actually stated that «nanoproperties» occupy an intermediate region between the world of individual atoms, controlled quantum mechanics, and the macroscopic world, well described in the various continuum theories (elasticity, hydrodynamics, and electrodynamics, etc.).

The English term Nanotechnology was coined by Japanese professor Norio Taniguchi in the mid-70s of XX century and used in the report «On the main principles of Nanotechnology» at an international conference in 1974, long before the start of large-scale work in this area. In «physical approach to Nanotechnology», it is believed that the world learned about nanotechnology from a speech by R. Feynman «There, at the bottom is full of places: Prospect and invitations to the new world of physics» (1959). Widely known they became after the work by E. Drexler «Engines of Creation: The Coming Era of Nanotechnology» (1986), where nanotechnologies are considered by replacing the traditional human technology «up-down» («bulk technology»): nanotechnology – a technology «Bottom-up», when molecular assemblers (qualitative analogues of ribosomes) are able to create any chemical structure, if there is its atomic list. By E. Drexler, assemblers “promise to bring about change, as profound as the industrial revolution, antibiotics and nuclear arms connected in one huge breakthrough», «will make such a revolution, such as was not since the appearance of the ribosome». Now the scientific communities are more likely to trust the scientific caution R. Feynman than futuristic abo E. Drexler [7, p. 43–76].

Nanotechnology made it possible to carry out much of what was previously impossible to dream of. Nanotechnologies have high expectations, first of all, from the point of view of the possibility of their application in the business sector and the expansion of human socio-economic capabilities [2, p. 49–58]. Nanotechnology is thus surrounded by a cloud of opinions, expectations, interests, beliefs, discussions, rumors and other forms of expression of the relationship in which it acquires its social and cultural profile. However, it can be harmful. One of the biggest worries is the threat of global disaster that creator assemblers Eric Drexler called «invasion of gray goo» and «Black Swamp» [6].

The second component is *biotechnology*. Biotechnology is any technology that uses living organisms or substances isolated from these organisms to make or modify a product, improve plants or animals, or create microorganisms for specific purposes. Biotechnology is also called the science of the use of living processes in production [8, p. 210–211]. It follows from all that biotechnology is an interdisciplinary field that arose at the junction of biological, chemical and technical sciences.

Biotechnology is one of the main steps in realizing the aspirations of mankind to use natural phenomena for their own benefit. This concept combines fundamental science with practice, the acquisition of knowledge with their practical application.

At the present stage biotechnologies are used in three main areas: industrial biotechnology, cell engineering, and genetic engineering.

Industrial biotechnology is aimed at solving a number of problems: medical diagnostics and pharmacology, plant breeding, environmental protection, safe production of the chemical industry, oceans biology, etc. Cellular engineering develops research in the following areas: obtaining hybrids, compiling genetic maps, cloning, etc. Genetic engineering, in its turn, is engaged in the development problems of increasing the productivity of microorganisms, the search for new sources of nutrients, explores transgenic organisms.

Such technologies are used as a practical tool for subtle intervention in a living organism in order to manipulate human tissues, cells and even genetic material in order to change it in the required direction.

Today, the following advantages of biotechnology objects are distinguished: cells are a kind of «biofactories» that produce a variety of valuable products in the process of life: proteins, fats, carbohydrates, vitamins, nucleic acids, amino acids, antibiotics, hormones, antibodies, antigens, enzymes, alcohols, etc. Many of these products, which are extremely necessary in human life, are not yet available for production using non-biotechnological methods due to the scarcity or high cost of raw materials or the complexity of technological processes; cells reproduce extremely quickly ; during the life of the cells during their growth, a large amount of valuable products enters the environment, and the cells themselves are the pantries of these products; the biosynthesis of complex substances such as proteins, antibiotics, antigens, antibodies, etc. is much more economical and technologically more affordable than chemical synthesis; the possibility of carrying out a biotechnological process on an industrial scale, in laboratory research, i.e. the availability of appropriate technological equipment, the availability of raw materials, processing technology [10, p. 222–225] .

The third component is information-communicative technologies. This significantly affects the intensity of information flows in society. Such intensification is an undoubted blessing for mankind; the Internet is becoming a large-scale socio-cultural phenomenon. Diving into the Internet, the user gets access not just to individual information posts, but to the whole system – the world of virtual reality.

Information technology (IT) is a process that uses a combination of tools and methods for collecting, processing and transmitting data (primary information)

to obtain new quality information about the state of an object, process or phenomenon (information product).

The most dynamically developing information technology in the field of market infrastructure: enterprises engaged in brokerage services for the sale of goods, securities and currency, still like and advertising and representation services and auditing activities feature in the main new modern information technology.

Another link of NBICS is *cognitive technologies*, which give rise to the practice of modifying human consciousness, during which human consciousness can be integrated with other consciousnesses, computers and databases. Examples are graphical interfaces created by firms such as Apple and Microsoft. Their basis was research that showed the practical limitlessness of human visual memory. Based on knowledge of the laws of perception, virtual reality technologies are widely used in simulators [4, p. 186] .

Cognitive technologies are based on the study of consciousness, cognition, various features of the thought processes and cognitive behavior of living and thinking beings like to neurophysiological and molecular biological positions, so and with the help of humanitarian approaches. The development of cognitive technologies can give the opportunity on the basis of the study of the functions of the brain and the mechanisms of consciousness and behavior to develop algorithms that actually will «animate» artificial technological systems.

Thanks to this category of technologies that allow direct contact with artificial superintelligence, the range of a person's natural ability to process information can be significantly expanded.

The prospective of cognitive technologies is due to their orientation towards the development of human intellectual abilities, his imagination and associative thinking.

Thus, there are distinguished the distinctive features of convergence as a cognitive technology:

- bringing together intensive interaction between various fields (scientific and technological) up to merging into a single scientific and technological field of knowledge;
- heuristic synergistic effect;
- -possibility of rapprochement of diverse subject areas of the world from the atomic level of matter to intelligent systems;
- qualitative increase in human capabilities due to its technological restructuring up to the emergence of a new stage in human evolution.

The current stage of convergent development is associated with the participation of the fifth component – *social technologies* (and *socio-* humanitarian

knowledge, on the basis of which they are formed and developed) and the corresponding transformation of NBIC into NBICS. In the development of socio-humanitarian problems of convergent technologies, the main attention is paid to economic, educational, managerial, legal and ethical-environmental aspects. This approach is typical for the European view of the NBICS model. EU experts consider it too technocratic (although it focuses on improving human qualities) and consider it necessary (preserving its core) to expand, integratively complementing it with social, anthropological, philosophical, environmental images and models.

V.N. Ivanov and V.I. Patrushev immediately give three definitions of the concept of «social technology».

1. A specially organized area of knowledge about the methods and procedures for optimizing human life in the context of increasing interdependence, dynamics and updating of social processes.

2. The way to carry out activities on the basis of its rational division into procedures and operations with their subsequent coordination and synchronization and the selection of optimal means, methods for their implementation.

3. The method of managing social processes, providing a system for their reproduction in certain parameters – quality, property, volumes, integrity of activity, etc.

They also give the following classification of social technologies:

- 1) by the nature of the action: strategic, tactical, operational;
- 2) by time of action: long-term, medium-term, short-term;
- 3) by methods: forecasting, social diagnostics, modeling, design, planning, social control;
- 4) by management level: global, continental, national, regional, local [9, p. 48].

In turn, Alexeeva I. Y., Arshinov V. I., Chekletsov V. V. state that for socio-humanitarian component NBICS important lively project-oriented co-operation. It is this form that is most adequate to the transdisciplinary methodology of the formation of convergent technologies as a process associated with the development of socio-humanitarian knowledge, with the emergence of a new «transformative anthropology». This is the field of activity of social humanitarian technologies. The focus here is the study of the processes of generating new meanings in a wide range of intersubjective interactions, when there is a transfer and transformation of knowledge from individual to individual, from organization to organization, from artifact to individual. As well as the study of the processes of communicative transfer of knowledge in space and time in order to minimize the corresponding time and energy costs. In fact, we are

talking about improving the efficiency of existing and designing new creative communicative interfaces in the synergetic system «Man – the recursive complexity of the environment – man» [1].

The result of the simultaneous action of these technologies (full control over the structure of matter at the atomic level, full knowledge of biological processes from macro to micro and molecular levels, and superhuman artificial intelligence, when the evolution of the human mind will accelerate to such an extent that further changes will lead to the emergence of mind with much a higher level of speed and a new quality of thinking) lead to an explosion of their development to infinity, which is associated with the onset of the singularity and which should to happen, as shown by the extrapolation of certain trends ... [6].

As a result of technological singularity, a posthuman is formed. Transforms the human body and mind, including ethical systems, as a result, it is appeared a question of the limits of humanity. Transhumanists believe that numerous scientific developments leading to a change in human nature serve the good, as they contribute to the opening of new borders and opportunities for humans [11, p. 87–88].

Reality created by basic technologies of the XXI century, enters into profound contradiction with the temporitme our society, which was formed in the course of his entire preceding evolution. The globalizing practice of using technologies of the XXI century literally before our very eyes turns human being into an object of increasingly daring and extremely risky manipulations.

In this connection, there are words of F. Fukuyama «Many believe that the posthuman world will look a lot like ours – a free, equal, flourishing, caring, compassionate, – but only with better health, longevity and, perhaps, higher level of intelligence. However, the posthuman world may be much more hierarchical and competitive than our present, and therefore full of social conflicts. This can be a world where the lost is any notion of «universal», so that we will mix human genes with the genes of so many species that it will not be clear, what is man» [14, p. 308].

Conclusions and offers. Thus, the scientific analysis of the problem and the study of relevant literature suggests that considering by us converged technologies in the next decade will determine the further development of terrestrial civilization, will cause the next strategic technological breakthrough, creating powerful tools for solving global problems of planetary civilization. However, at this stage, the role of nano-, bio-, info-, socio-, cognotechnology on the development trends of society cannot be fully appreciated and unambiguous answers are not possible.

Ways of further research work may be related to the problems of forecasting the dangers and risks of convergent technologies, which by their nature cannot be safe. This requires the creation of new theoretical concepts, methods and tools for interdisciplinary research and communications, new organizational forms and structures, business models suitable for both organic and inorganic substances. Such large-scale research and development require respectively appropriate investment.

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АНОТАЦІЯ

Зленко Н. М. Філософський дискурс конвергентних технологій в сучасному суспільстві.

У статті розкривається сутність та зміст поняття «конвергентні технології», доведено, що розвиток NBICS-технологій являє собою новий етап інтеграції наукового знання, на якому формуються принципово нові об'єкти пізнання і діяльності, що включають фізичні, хімічні, біологічні, психологічні, технічні та соціальні складові. Здійснюється аналіз основних процесів, що відбуваються в суспільстві на тлі розвитку і впровадження конвергентних технологій. Розкриваються принципи міждисциплінарності, взаємозалежності і взаємопроникнення змісту NBICS-технологій.

Підкреслюється, що людство в результаті вибухового характеру сучасної науково-технологічної революції, де глобальні NBICS-технології починають займати чільне місце, підійшов до нового етапу свого цивілізаційного розвитку.

Ключові слова: NBICS, конвергенція, технології, нано-, біо-, інфо-, соціо-, когнотехнології, сингулярність.

АННОТАЦИЯ

Н. М. Зленко. Философский дискурс конвергентных технологий в современном обществе.

В статье раскрывается сущность и содержание понятия «конвергентные технологии», доказано, что развитие NBICS-технологий представляет собой новый этап интеграции научного знания, на котором формируется принципиально новые объекты познания и деятельности, включающие физические, химические, биологические, психологические, технические и социальные составляющие. Осуществляется анализ основных процессов происходящих в обществе на фоне развития и внедрения конвергентных технологий. Расскрываются принципы междисциплинарности, взаимозависимости и взаимопроникновения содержания NBICS-технологий.

Подчеркивается, что человечество в результате взрывного характера современной научно-технологической революции, где глобальные NBICS-технологии начинают занимать главенствующее положение, подошло к новому этапу своего цивилизационного развития.

Ключевые слова: NBICS, конвергенция, технологии, нано-, био-, инфо-, социо-, когнотехнологии, сингулярность.