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**COGNITIVE PSYCHOLOGY AS A COMPONENT OF NBICS – TECHNOLOGIES****SHMARGUN V. M.**, Doctor of Psychological Sciences, Professor, Professor of the Department of Psychology*E-mail:* Shmargun2012@ukr.net**SHMARGUN T. M.**, postgraduate student of the department of Management and Educational Technology*E-mail:* Shmargun2000@ukr.net**KOSTENKO M. P.**, Doctor PhD, Head of Department of Physical Educationy *National University of Bioresources and Nature Management of Ukraine**E-mail:* futbol.kostenko@gmail.com

**Abstract.** *From the standpoint of neocognitive psychology, the article examines the active role and impact of technology on all spheres of human existence, including the functional qualities of the human body and brain. The vectors of technomodification and integration of the human psyche are marked. The manifestation of new technological possibilities that allow to modify the sensory-perceptual sphere of man, to change the qualities of his subjective reality and consciousness is shown. The limits of technomodification, within which the human qualities of an artificially created personality are preserved, are discussed. The sphere of activity of neocognitive psychology in researches of the artificial mental organisms generated by technologies of technomodification, social communication, a society and the technogenic environment is considered. The moral and ethical problems that arise when a person intervenes in the processes of life are shown.*

**Keywords:** *artificial subjective reality, sensory systems, consciousness, human techno-modification, NBICS-technologies.*

**Introduction.** An important feature of present day is the accelerated development of science and technology in such fields as nanotechnology, biotechnology, information technology, cognitive science and the development of the social environment. These technologies are not developed in isolation, but actively interact with each other. The term NBIC Convergence was introduced in 2002. However, after 5-6 years it became clear that the first four basic technologies could not be considered in isolation from the block of social sciences and humanities and it was proposed to expand NBIC-convergence to NBICS-convergence, which opened a huge field for humanities. In general, we can say that the phenomenon of NBICS - convergence, which is developing before our eyes, is a fundamentally new stage of scientific and technological progress.

Any scientific and technical system develops according to certain laws: knowledge accumulates, then it is transformed into technologies that lead to new types of production, and science faces new challenges. Distinctive features of NBICS - convergence are:

- intensive interaction between scientific and technological areas;
- wide coverage of the analyzed and affected areas - from the atomic level of matter to intelligent systems;
- identifying the prospects for qualitative growth of technological capabilities of individual and social development.

Thus, we have the name NBICS - convergence (after the first letters of the directions of development: N-nano; B-bio; info; C-cogno; S-social). The most advanced of these technologies - information and communication. Due to

the possibility of computer modeling of various processes, they significantly affect the development of other technologies. In particular, information technology is successfully used to model biological systems. So far, many different models have been created, ranging from molecular and cellular to models of the whole organism. There is a reverse process when biotechnology influences the development of computer technology. The interaction between information technology and nanotechnology is also twofold. On the one hand, information technology is used for computer simulation of nanodevices. On the other hand, nanotechnology is already widely used today to create more powerful computing and communication systems.

In future, according to experts, the interaction between information and communication and cognitive technologies may be the most perspective. Today, information technology has made possible better study of the human brain than before, and their further development in the future will allow for its comprehensive computer modeling, including simulation of mind, personality, consciousness and other properties of the human psyche. In addition, the development of brain-computer interfaces offers ample opportunities to connect artificial body parts and donor organs to humans through the nervous system. Information and communication technologies are already being used to strengthen human intelligence. They significantly complement the natural abilities of man to work with information: computer software systems are being developed that enhance and expand human mental processes.

**Analysis of recent researches and publication.** Among the branches of NBICS - convergence, cognitive science is relatively young, but promising. It is an interdisciplinary convergence of psychology, physiology, medicine, anthropology, linguistics, neuroscience and computer science, including artificial

intelligence. The latter is perhaps the most important component of scientific and technological growth, which will lead to better study of the human brain and higher nervous activity, computer modeling and brain stimulation, development of brain-computer interfaces. Here we are talking about expanding the interaction "brain - brain" and "brain - machine" by connecting to the human nervous system. In addition, multimodal platforms may be developed for people with impaired sensory-perceptual analytical functions as initial forms of cognition. Creating virtual environments for learning and work, not limited by the distance or physical scale at which it is performed.

The crown of this direction, probably, should be the creation of universal artificial intelligence, more complete knowledge of the human brain, capable of independent learning, creativity, free communication. Undoubtedly, the embodiment of human knowledge acquired over the centuries about the microstructure of the brain, the work of the neuron system in the working model of new projects, so that this knowledge can be collected and tested, would be of great importance for psychological science. This would contribute to the development of technological directions for improving the psychosomatic health of man and his psychophysical capabilities.

The new way of life in "civilized society" is associated with the invasion in the sacred thing of the human body - the work of the brain. There have been significant changes both in the problem field and in the organizational structure of institutions dealing with a completely new and virtually unpredictable object of influence - the brain. The human brain, firstly, is a material object, a substance; secondly, it is a substance that works on energy, and its own production, the whole human body works as a power plant to ensure the efficiency of the brain; thirdly, it produces information; and fourthly, although it became the subject of study

and research, it never revealed the secrets of his organization and work.

It should be added that social and cultural circumstances are actively involved in its work and formation. Therefore, we know for sure that our thinking, as it is in itself, is a natural and social product of the brain. In the brain there are unknown and therefore unpredictable connections of matter and consciousness, types of connections that do not even have adequate names. And despite this, tiny knowledge (compared to the huge white spots in the study of the brain) is already beginning to be used for active intervention in the brain of ordinary (or sick) people. Radical, difficult to predict prospects for further escalation of such an intervention raises significant questions: is human evolution canceled by innovations that came from the virtual nature?

The future has already come, but we cannot say anything about it yet, how it is arranged, what forces it manages and what consequences it attracts, and most importantly - threatens. It is clear that this future will require a completely new level of self-organization, new positive programs, new grounds for solidarity and consent from man and society (or communities, to put it more mundanely). It will be necessary not so much to protect human nature from uncontrolled "improvement" as to shed light on the limits within which interventions in human biological and personal life are permissible and desirable.

Neural networks have long been working in very real production and software processes. And perhaps there will be new mental tools to describe and explain the workings of neural substance, new devices and new principles on which these devices will work. Quantum computers, biorobots, nano machines, and genetic technology can significantly change today's understanding of science and technology. We do not know whether analytical psychology will be replaced by any synthetic one, but it will certainly raise the question of psychological problems of

man-made modification. If we accept the logic that the types of thinking depend on the basic pro-element (matter, energy, information, brain) of civilization, the conclusion is that there are no more logical grounds for thinking about evolution as an interconnected, predictable process. However, the degree of freedom, and hence the degree of complexity, does not fit into the mental, cognitive apparatus that has hitherto been used by psychological science. In front of it is a terra incognita, which promises colossal gains and at the same time the threat of irreparable catastrophes.

We live in an amazing era of domination of omnipotent technologies of total transformation of the world, man and society. Technoscience has become an active creative force on a planetary scale, which tries not only to understand but also to change the very nature of man. Techniques and technologies with the capabilities of artificial intelligence (not yet the mind) are already inevitably captivating man and his world, leaving him no chance for freedom of choice. A new technobiotic man is being formed. In fairness, it must be acknowledged that it is as a result of the development of the natural sciences and the accompanying technological progress that many mysteries of nature, previously inaccessible to our direct perception, have been solved. Nevertheless, the limitation of human sensory systems leads to permanent perceptual uncertainty, simplification and inconsistency of the complex world around us.

We already know a lot about the structure of the human body, its biology and physiology, psyche and almost nothing about his soul. Here the achievements of science are quite modest. Psychology used to be the science of the soul, but now it has become the science of its absence. Psychology, of course, can be blamed for refusing to study the soul. So far, only literature and art can come closer to understanding the soul. Perhaps science will succeed if it

gains the experience they have gained. According to VP Zinchenko, "no one has yet succeeded in" revealing the mechanism of the miraculous, to take the absolute by storm (not only in the field of psychology), the soul cannot be reduced to knowledge, feelings and will. The soul is a mysterious excess of knowledge, feelings and will, without which their full development is impossible "[2, p. 4].

Let's focus on technology and areas of human technomodification. There are two trends in the use of technology to modify man and his life in artificial communities and environments:

- creation of interfaces between the human body and the controlled elements of the technological environment;

- modification of the brain, sensory and sensorimotor systems, mechanisms of mental and conscious regulation. To solve the problems of the first direction, the use of NBICS technologies is promising in order to form a virtual multimodal working environment, micromechatronics, augmented reality technologies and induced environments as elements of communication with natural human perceptual systems [2]. Methodological categories in this area: interaction, algorithmization, adaptation, regulation. The main problems of interface integration are related to the provision of optimal forms of information and the formation of effective conceptual models of activity. In addition, the limitations of the interface approach are due to the low capacity of the human senses and a small amount of working memory. This creates obstacles for the implementation of complex control algorithms.

Second-line technologies are mainly related to genomic engineering (genome editing technologies, synthetic biology and psychology and their variants, which study changes in brain substrate at the genetic, molecular and structural-functional levels, as well as technologies evolving within a number of clusters: GRIN (G - genetic, R - robotic, I - information, N - nanoprocesses), GRAIN (G - genetic, R

- robotic, AI - artificial intelligence, N - nanotechnology), BANG (B - bits, A - atoms, N - neurons, G - genes) [2].

The ability to manipulate atoms of matter with the help of nanotechnology allows for a new fusion of such powerful tools for influencing nature as nanotechnology, biotechnology, information technology, cognition and neurotechnology. General technological platforms are formed. For example, BANG convergence allows you to manipulate information bits, matter atoms, brain neurons, and genes that encode life flexibly. Convergent technologies include nanobiotechnology, synthetic biology, DNA computing and neuroengineering. The main methodological categories of technomodification: mutual orientation, integration, mechanisms of life, operational isolation, organized complexity of development, self-organization, evolution.

Problems and directions of technomodification of the psyche

The main problem of technomodification of the psyche through technological changes in brain structures is that we still largely do not understand the relationship between physical and mental structures of the brain and the human psyche. We do not know what types of mental are generated and live in certain brain bioforms and how to reproduce them artificially. In addition, we are a social product and it is unclear how and in what types of social communication "artificial people" can develop and fit into the processes of biosociogenesis.

We can identify the following problem fields, stages, directions and forms of technomodification of the psyche and technointegration of man with technobiotic environment:

- human interaction with the natural world and its objects (interface problem);
- human interaction with artificial objects, systems and environments (the problem of presence in the environment, immersion, interactivity);

- human interaction with artificial systems and environments endowed with artificial intelligence, strengthening human intelligence in the intellectual environment (the problem of intellectual symbiosis, inactivation);

- technomodification of subjective reality (problems of creating new and additional sensory modalities and their integration into new forms of subjective realities);

- technomodification of the emotional-sensory sphere (new forms of sensuality and emotions);

- technomodification of the human "I" (the problem of the artificial subject);

- artificial intelligence, local and distributed in an organized environment (the problem of constructing mental and cognitive structures);

- social processes in self-organized network communication;

- technogenic personality (the problem of selection and education of individuals who are not marked by the mechanisms of the technobiotic immune system);

- techno-modified evolutionary society.

In particular, the psychology of technointegration should include in its sphere of interest psychological disciplines that reflect the results of purposeful change of the human psyche under the influence of the technoenvironment and evolving global mechanisms of human integration with the artificial world of technobiode. The psychology of technomodification considers the design and implementation of technologies of new mental forms with predetermined properties, as well as the design of means to mitigate the negative effects of NBICS - technology on a man and his psyche.

**Discussion.** The rapid development of nanotechnology and cognitive science has led to their synergetic interaction and the formation of the concept of NBICS - convergence. Nanotechnology accelerates NBICS -

convergence, as it combines different areas of activity that were previously developed mainly separately. Psychological science, in particular neocognitive psychology, is an integral part of NBICS - convergence, as it interacts to one degree or another with all its components and aims to improve the quality of human life, health and ability to work.

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**КОГНІТИВНА ПСИХОЛОГІЯ ЯК СКЛАДОВА NBICS – ТЕХНОЛОГІЙ****Шмаргун В. М., Шмаргун Т. М., Костенко М. П.**

**Анотація.** *З позицій неокогнітивної психології у статті розглядаються активна роль і вплив технологій на всі сфери людського буття, включаючи функціональні якості організму й мозку людини. Позначені вектори техномодифікації й інтеграції людської психіки. Показано прояв нових технологічних можливостей, що дозволяють провести модифікацію сенсорно-перцептивної сфери людини, змінити якості її суб'єктивної реальності й свідомості. Обговорюються межі техномодифікації, в рамках яких зберігаються людські якості штучно створеної особистості. Розглядається сфера діяльності неокогнітивної психології в дослідженнях штучних психічних організмів, породжуваних технологіями техномодифікації, соціальною комунікацією, суспільством і техногенним середовищем. Показані морально-етичні проблеми, що виникають при втручанні людини в процеси життя.*

**Ключові слова:** *штучна суб'єктивна реальність, сенсорні системи, свідомість, техномодифікація людини, NBICS-технології.*