

Problems of Predicting the Effects of NBIC Technological Expansion*

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Abstract—This article covers the high demand for the science's forecasting function at the present stage. The impetuous progress of NBIC technologies sets a task of finding the ways for reasonable management of experimental and practical developments. The work notes that the need for development and comparative analysis of various options of the foreseeable future at all the levels of the biological and bio-social reality puts a special emphasis on both scientific and technological and humanitarian expert evaluation. It is stressed that the existence of a variety of real and hypothetic factors posing a threat to humans and mankind at large assumes the formation of a responsible and careful approach with clear understanding of consequences.

Keywords—*forecasting; scientific expert evaluation; NBIC-convergent technologies; future designing; high-hume-technologies*

I. INTRODUCTION

The twenty first century has brought plenty of novelties to various spheres of human existence. The innovative activity is becoming the most important one. Acquiring an increasingly interdisciplinary nature, the studies in different fields of science and technologies are currently at the stage of transition to a brand-new phase, namely from divergence to mutual convergence, and from analysis to synthesis. Various projects are being developed, including projects that are aimed at transforming the human environment and human being himself. The sphere of technoscience mirrors this trend most brightly. The efforts taken by theorists, experimentalists and engineers are being combined within the framework of the convergent technologies. Recently, a radical change in the nature of interrelations between the fundamental and applied researches has been observed. Before, the applied researches were quite often a short variant of the academic ones. Today, in order to obtain practically meaningful results in such a leading-edge field as NBIC-technologies, it would be required to increase significantly the volume of and improve essentially the quality of fundamental developments [1]. As a result of the intensively expanding and deepening anthropogenic impact on the living environment and own nature, all the levels of

the wildlife and inanimate nature are actually and potentially engaged in the sphere of activities. Everything on the planet is closely interrelated to each other, and anything pernicious for one part may not remain indifferent for the other. The difference is only in the rate of impacts, their depth, and a direct or indirect result. A practical human impact is especially specific. The intensification of the process that transforms convergent technologies into a direct productive force gives rise to the need for development and comparative analysis of various options of the foreseeable future at all the levels of the biological and bio-social reality.

II. TRANSFORMATION OF HUMAN BIOLOGICAL NATURE AS SCIENTIFIC AND TECHNOLOGICAL TASK

Since the New Age era, mankind has been exerting considerable efforts to subordinate and “design” the external world. However, the task to transform the nature from “the temple” into “the workshop” has turned out to be a challenge. The old paradigm postulating that the nature is an endless reservoir of resources for human activities has turned out to be far from being true, and modern environmental crises is a clear evidence of that. However, the human continues putting hopes on the scientific and technological progress that has already equipped him with impressive means of world transformation and offering a hope to strengthen their power in future. In these conditions, the human has put a new scientific and technological task, namely transformation of himself, development of various methods of impact on his own biological nature. The technologies for human potential unlocking and efficient use (so called high-hume-technologies) are named as a key progress direction. The process of introducing into the human consciousness the idea of substitution of the biological development with the technological one, technology integration with the human body, total automation etc. is gaining pace.

The science as a beloved child of our civilization has not only failed to be a panacea for all disasters and crises. On the contrary, it increasingly reveals a crafty duality of its face: the science helping the life and, at the same time, threatening the life, solving problems and creating them even more. Modern genetics, nanotechnologies, cognitive researches are a tool for intervening into the evolution of the alive, an instrument for invading into the human life regulation

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processes, including the underlying (genetic) level. As a result, the preservation of the human biological foundations themselves and individual identity comes to the fore in the system of global civilization challenges. At the current stage, one realizes more and more clearly the necessity of a detailed and comprehensive study of various problems initiated by convergent technology development. The establishment and impetuous progress of information technologies, cognitive researches, nanotechnologies, genetic and cell engineering, biogeocenosis engineering etc. sets a task of finding the ways for reasonable management of experimental and practical developments. Uneven science development against the backdrop of snowballing growth of total knowledge is one of the reasons why contradictions between the human capability to make a change in the natural environment and/or human organism and the awareness of consequences from this change are not smoothed out, but to the contrary, they are becoming more and more acute and dramatic.

III. KEY TRANSFORMATION TRENDS OF MODERN TECHNOLOGICAL DEVELOPMENT

Historically, information technologies are the first in the four directions of NBIC-technologies. The issues relating to the consequences of their establishment and practical immediate implementation, which were initially theoretical, have already become practical requiring a search for and acceptance of real conceptual, organizational and activity approaches to their solution. If, in the beginning of the sixties of the last century, the ways of technogenic evolution were not identified clearly enough, the current NBIC-technology capabilities realize much of those that seemed once illusively distant and unrealizable. Today, the instrumental approach prevails, and the relevant instrumental and rationalistic mindset prefers the question "Could it be done and how?" over the question "What for?" In the context of scientific and technological progress, this is associated with the risk of too radical deflection of the development trends that already took shape so far. The primary focus of scientists is not only on the issues relating to information society establishment, but also the problems of introducing bio-, nano-, cognitive technologies and associated changes to the social space into everyday life, the tools and conditions of actual and potential transformations, and attitude to the transhumanism ideology that is actively implemented and places the principle of perfection and new opportunities as imperative. The outlines of the new civilization spiral are already appearing. The modern hi-tech environment serves as a trigger for changing the forms of communication and a pre-requisite for changing the traditions and forming new values. The orientation to active world transformation with technological means rather than personalized improvement is taking more distinct shape.

A very serious situation is developing in implementing bio-technologies. The genetic engineering brings a number of risks and pitfalls. The achievements of the modern human genetics mainstream the issue of how to distinguish the technologies promoting human prosperity and the technologies posing a threat to human dignity and well-being. In particular, it is referred to admissibility or inadmissibility (due to humanitarian and ethical and moral considerations)

of some or other biomedical experiments or the ethical principles of genetic diagnostics, genetic engineering, a number of psychogenetic researches, including psychosurgery, in one word, those actions that may potentially threaten to human health, conceal a danger of personality manipulation by encroaching upon the inalienable personal freedoms and rights. The range of relevant socio-ethical and humanitarian problems are immensely wide, which is reflected in development of various ethical codes regulating the use of scientific and technological opportunities of the genetic engineering. The modern level of knowledge about heredity and variability of humans (and the alive at large) does not yet allow to solve a quite number of important issues. As an example, we may note that after almost two decades when the Human Genome project was over (2001), no genetic therapy method that would be considered absolutely reliable and safe even for monogenic diseases has appeared. There is not so much knowing about the system resistance of human organism; human ceilings have not been specified and the aggregate picture of whole genome regulation has not been created.

High technologies also impact the modern human's worldview by way of promulgating transhuman and posthuman existence. This ideology is very actively communicated by various transhumanist associations and movements. The transhumanism disowns the human body immunity and inalterability, declares a need for human body transformation, saturation with nanorobots, life virtualization, revision of traditional views of life etc. [2], [3]. Unfortunately, one may not deny a potential opportunity for nanotechnologies to become the first global technologies which implementation will result in the change of the social paradigm and formation of a society where artificial intelligence and synthetic reality would dominate in all crucial spheres of human activities. The means for achieving the posthuman existence may presumably include cognitive technologies, medicines that change the mood, increase sensibility, memory enhancement drugs (so called neuroceuticals, sensoceuticals and cognoceuticals), anti-aging therapy etc. Modern laboratories are also engaged in developing a theme of 'brain-brain' interfaces that enables non-verbal communication. Specialists clarify: "It looks like this: a helmet is put on you or you are implanted with a chip, and you may remotely operate some device or even transmit your thoughts to another person. However, telepathy is a kind of science fiction, while this is a real achievement. Here, we have telepathy with an intermediary, i.e. there is nothing mystical, only complete science" [4]. This is one more step in the development of cyborgization that is already an objective process. Another direction of neurobiology relates to artificial activation of brain cells. It becomes possible as a result of genetic neuron modification by way of light beams of certain wavelength. For this purpose, it is planned to use special proteins from seaweeds or bacteria enabling to convert light energy into own energy. The emission penetrating into the brain is capable to activate specific neurons. The procedure is aimed at stimulating memory. Along with this, an opportunity arises that may call, for instance, false memories or erase unnecessary memories (moments of stress that induce heavy depressive disorders,

for example, in a situation of posttraumatic syndrome development that degrades the quality of human life) [5].

In this context, serious concerns appear that such achievements would find applications in the sphere of targeted human behavior manipulation. With the help of brain-machine or brain-brain interfaces one may form a distorted picture of reality in the human brain, trigger certain emotions, thoughts, and provoke actions [6]. Essentially, one may speak of individual and mass conscience control. Thus, the role of tech-social expert evaluation would increase significantly. Before making a decision on implementation of research results, a comprehensive assessment of consequences would be required. Plenty of questions arise. For example, would not the man turn out to be an excessive, dangerous and unreliable element in the hyper-intelligent machine? Not all scientists consider such issues noteworthy stating that “so far, neurocomputers are close to human intelligence in the same manner as a spade handle is close to a living tree” [7]. Apparently, it could be explained by the fact that as specialists being deeply submerged into the research subject, they often fail to see the whole picture, including the transformation dynamics of the society’s value system.

In influencing the medical science, ecology, power industry, military sphere, consumption, ideology, the convergent technologies are potentially cable to lead to changes in lifestyles, replacement of communication forms and generation of new social communities actively using new opportunities of interfaces and virtual reality. In this context, new specific scientific and moral, and ethical problems arise. The solution of these problems could determine the face of the future’s technogenic civilization. Some of the reshaping trends under review are quite feasible in the nearest future, while some of them are futuristic. However, what that seems unreal today could be realized tomorrow.

Thus, there are a whole set of studies evidencing that the hi-tech environment starts deforming humans by impacting their ethical integrity and spiritual and ethical attitudes. The convergent technologies are rightly considered not only a new stage of scientific progress but also the destruction of the world of man, more precisely the invariants of this world that make a human being - human.

IV. NECESSITY TO EXPAND THE REQUIREMENTS TO SCIENTIFIC EXPERT EVALUATION

In this context, the requirements to scientific expert evaluation have been significantly expanded. Before, the analysts relied upon “the presumption of progressivity, and therefore, usefulness of any novelty”, as far as “the grand total was unambiguously assumed positive” [8]. Today, in the course of expert evaluation, it is required to review not only technological parameters, since a result of the significant successes of science and engineering and coming along socio-cultural changes, “an unfavorable shift of value criteria is taking place” [9]. The management of complex processes assumes the development of a scientifically and humanistically substantiated objective of regulation and

selection of preferable means of its realization. Moreover, the existence of numerous hypothetical factors representing a threat to humans and mankind at large update the task of establishing the real limits in using the scientific and technological capabilities of convergent technologies. The awareness of the fact that forecasts for the future as activity milestones are determined by some or other interests leads to the conclusion that a thoughtful approach is required for selecting expert candidates. Professionalism, high moral qualities and impartiality are among the key selection criteria. Upon those who deal with forecasting a heavy responsibility is rested for reliability of forecasts and for how assumed changes in the sphere of science and engineering may have an impact on human life in the short and mid-term.

The challenge now is to construct some synthetic theory in order to explain the specifics of work not just with living beings but also with a human being. This theory should involve both the regularities of technological expansion scaling-up and enhancement into human activity practice and the in-depth review of potential negative effects of such an expansion. In the course of development, it is required to take into account the fact that radical changes being brought by new scientific and technological capabilities to the life of modern humans are objectively able to lead or are already leading to strengthening certain values and devaluing the others. One of the most reputable thinkers of modern times J. Habermas takes a very rigid stand to that effect: “the technocratic consciousness reflects not a violation of moral interdependence, but ousting of “morality” in general as a category of life relations” [10], considering public discourse a means for the science to get rid of the technocratic ideology. A contradiction between the instrumental dynamism of a human as active being and his high responsibility as being that possesses morals is most clearly manifested in the field of scientific and technological expert evaluation. The most important question that relates to NBIC-technology implementation is the following: what of anything that is in principle possible scientifically, as well as potentially realizable technically and technologically would be acceptable for a human being and simultaneously desirable and feasible in the society? Depending on the reply, the future of our children and grandchildren would depend, as well as it depends in what world they will live and whether this scientified and technologized world would remain human.

V. CONCLUSION

Mankind is currently facing its most difficult challenge — to avoid catastrophic consequences of NBIC-convergent technology implementation. For addressing this challenge, it is required to apply modern methodological tools for forecasting, analysis and identification of priority and supporting directions of researches, concentration of efforts and consolidation of the academic community. In the current context, an absolutely precise and balanced assessment of existing opportunities is required to make sure that the transfer of high technologies would be targeted at culture development rather than its destruction. It is very important to account for the limitation of human knowledge, as well as

the complexity and predictability in the functioning of the self-organizing systems that is far from being complete (the human society is exactly the system of this kind). The time has come for a radically new control and safety system that would enable to use high technologies as efficiently as possible without forgetting, at the same time, the 'Do no harm principle' of Hippocrates. Today, under the conditions of high risk of a radical and irreversible refraction of social development, the key task is not to allow an upheaval in the system of values that give meaning to and form the foundation of the human life.

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