ЦИФРОВІ ТЕХНОЛОГІЇ

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FUTUROLOGY CONCEPTS OF INFORMATION SOCIETY

The main prospects of development of futurological research in the conditions of information society and acceleration of creation of artificial intelligence have been determined. The reasons and nature of changes in the methodology of scientific searches in the conditions of expanding the use of foresight are covered. The approaches of scientists to the possibility of reliable modeling of the future in the conditions of deepening of the process of globalization and development of the information society are investigated.

Keywords: futurology, modeling, artificial intelligence, foresight, synergetics, scientific abstraction.

Николаец К. Футурологические концепции информационного общества. *Определены основные перспективы развития футурологических исследований в условиях информационного общества и ускорения создания искусственного интеллекта. Освещены причины и характер изменений методологии научных изысканий в условиях распространения использования форсайта. Исследованы подходы ученых к возможности достоверного моделирования будущего в условиях процесса глобализации и развития информационного общества.*

Ключевые слова: футурология, моделирование, искусственный интеллект, форсайт, синергетика, научная абстракция.

Background. In modern conditions, there is a departure of futurology from the creation of global projects for the future existence of mankind, with the simultaneous transition to the development of specific issues and forecasts in certain areas of human activity. This transition is most likely motivated by the difficulty of making reliable forecasts for the relatively distant future and the need to focus on identifying the issues that are most troubling to the leading countries or regional leaders in the relatively short term. Research in the field of futurology has been divided into theoretical considerations about possible variants of the future and applied scientific

research, whose direction is determined by the needs of state bodies or large manufacturers. The applied direction of futurology was reflected in the implementation of the prognostic function of many social sciences. The implementation of such a function has resulted in scientific, technical, natural and social forecasting. In order to increase the scientific level of futurological forecasts, the methodological tools of scientific searches were constantly being improved. This improvement was due to the specific use of science. For a long time, science has been used by mankind mainly as a source of new technologies. Most of these technologies were used for the modernization of military equipment, and later innovations were implemented in the field of civilian production.

The analysis of recent research and publications. Some aspects of the investigation were represented in the works J. Andersson [1], M. Ford [2], F. Fukuyama [3], Y. Harari [4; 5], M. Kaku [6; 7], K. Schwab [8], N. Taleb [9], W. Zhang [10]. Researchers highlight the specifics of processing and modelling information with artificial intelligence and predict the nature of economic development in a climate-changing environment.

N. Taleb considered the problems of chance and probability, suggested options for risk analysis, criticizing social scientists for their simplistic attitude to the historical process and making unlikely forecasts. M. Ford made an attempt to predict the development of society in the context of increasing the role of robotics and the speed of creation and processing of information, which should accelerate the ageing of information. F. Fukuyama argued that replacing the irrational desire to be recognized above others by the desire to be recognized as equal may be the "end of history". The struggle for recognition as a driving factor of human activity was predicted as a means of forming a world-wide empire. M. Kaku predicted the prospects and consequences of using telekinesis, implanting implants into the human brain, developing machines that can be driven by thought, and more. It is important that for the majority of researchers the question of perspective interaction of the world of humans and machines with the possible consequences of the merger of such worlds and, accordingly, the need to develop new methods of analyzing the motivation of actions, including economic activity, is urgent. Therefore, the analysis of the latest methods of reality research is extremely important in the context of increasing speed and quality of information processing.

The **aim** of the study is to identify the main directions of development of futurology at the present stage in terms of deepening the process of globalization and to characterize the latest methodological base of futurological research.

Materials and methods. In the study, observance of the principles of objectivity, the combination of historical and logical analysis used orientation-value, statistical and behavioral methods of scientific knowledge and the method of scientific abstraction.

Results. The situation changed in the second half of the twentieth century, when the modernization of weapons of mass destruction led to the

emergence of means of destruction capable of destroying the planet. It was at this time, in the context of futurology, that scientific research of applied nature emerged, aimed at predicting political actions that could lead to fatal consequences for all mankind. At the same time, the development of technology has significantly influenced the nature of economic activity. In the conditions of formation and development of the information society emerged the so-called innovative economy, and the pace of change in the nature of economic relations, ways of adjusting production increased to previously unheard of scales. This led to the updating of futurological studies aimed at forecasting prospective economic activities in order to optimize investment. Therefore, futuristic knowledge from literary forecasting has gradually evolved towards so-called "factories" with the widespread use of cross-expert polling. The use of the simulation method for possible scenarios and strategic simulation oriented towards the study of subjects' behavior in artificially simulated critical choice situations has become widespread. In addition, the so-called foresight method was used, which involved multi-stage expert work.

The replacement of the individual work of science fiction writers with the work of specialized creative teams made futurological developments more scientific. At the same time, such creative teams were mainly focused on solving specific problems, which determined their composition, nature of work and the degree of scientific abstraction. The specificity of the problems led to a relatively low level of scientific abstraction in understanding the modeling of the future in the long term. However, large-scale multi-way combination planning has been widely used in the development of political combinations in the international arena and in the work of special services. At the same time, increasing the scale of planning with the increase in the number of specialists of groups using the foresight method, led to the leveling off of the personal component of the authors of the forecast. This, in turn, could lead to a more rational solution proposed by specific researchers, could be rejected in favor of solving the problem proposed by the team.

In addition, the flaws of a rational approach were gradually revealed in the design of future developments. The classical rational approach allowed us to analyze relatively small systems. And for the analysis of large systems with self-regulation and constant feedback, methods were needed to correlate knowledge of a complex system not only with operational means, but also with value orientations. The latter necessitated the analysis of irrational behavior. The effectiveness and necessity of such an analysis was, for example, proved by R. Thaler [11].

The problem of impossibility of using the Marxist methodology of estimating the future as a result determined by the past and present and coming into force of objective laws clearly arises before scholars. The unpredictability of the future, the absence of rigid determination of the historical process was clearly defined by K. Popper [12]. The innovativeness of the historical process, the impact on it of irrational actions and decisions led to

an understanding of the fundamental unpredictability of the future. But the interests and needs of leading players in the global political arena, of powerful manufacturers, have required finding effective tools to predict at least the near future. At the same time, the focus of the foresight on determining the likelihood of a particular result desired for customers limited the scope of scientific research and, accordingly, methodological tools. The result was a gradual understanding that the future is shaped by the present with the growing influence of the irrational actions of individual subjects. Therefore, when constructing a foresight, you do not need to artificially ignore a number of subjective layers that go beyond the interests of the customer. In this connection, K. Mainzer argued that while operating in complex organized systems, individuals operate under conditions of limited rationality. He emphasized that managing complex processes is a structured process that takes into account the uncertainty that exists in the real world and does not ignore it [13].

At the beginning of the XXI century Futurologists have distinguished themselves, who, analyzing the role of chance, the difficulty of identifying their causes on the basis of synergetics, conclude that the predictions of what and when will happen and what the future will be is complicated. The absoluteisation of unforeseen contingencies or the assertion of the impossibility of reliable knowledge regarding the occurrence of contingencies lead to pessimistic conclusions about a fatalistic interpretation of the future, which cannot be understood, and a certain fate cannot be overlooked [14].

In the modern period, it is important to use a synergistic approach for the futuristic analysis of economic phenomena and processes. In the works of E. Peters [15], A. Petrov, I. Pospelov, A. Shananin [16], V. Dolyatovsky, A. Kasakov, I. Kokhanenko [17], the study of economics by using nonlinear dynamics methods. The so-called synergistic economy was, in fact, associated with changes in nonlinear economic theory [10]. Among the Ukrainian scientists in this context it is worth noting the works of V. Sergeyev [18; 19]. The synergistic approach, based on the possibility of cooperation in complex systems, describes in a relatively better way the phenomena and events occurring in the context of globalization. It may be the methodology that enables effective forecasting. However, cooperation should not be interpretted or used for artificial incorporation or forcible integration. Defining the need to solve complex global issues through co-operation should not imply an automatic understanding of the need to neglect regional problems in order to solve larger ones.

At one time, one of the ideologists of globalization, Z. Brzezinski, argued that the modern world is characterized by interactivity and interdependence, and for the first time in history international conflicts have faded away from the common problem of humanity's survival. As a means of solving global problems, the researcher called geopolitical stability first, but analyzed it primarily from the point of view of US interests and needs in the context of growing influence of China and attempts of Russia, India,

Brazil to compete with each other for resources, security and economic advantage [20]. At the same time, in addition to the threat of a new world destructive confrontation, the influence of the development of cyberspace [2], which for some of the population of the planet is a kind of remedy for surrounding problems, and for others – the basis of economic activity. The development of economic activity in the context of increasing rates of urbanization also has a certain impact on this process. According to A. Ross, when technological advancement becomes a requirement for municipal services, the most advantageous position is the global cities, which can develop applications for citizens that will attract the class of "economy of the future" to metropolitan cities [21]. The development of artificial intelligence will require even more rapid data sharing and, according to some researchers, may even cause the division of people into different biological castes. In the XXI century post-industrial civilization, relying on artificial intelligence, bioengineering, and nanotechnology, can make entire countries and continents unnecessary. The self-proclaimed "civilized" zones will then have at their disposal the latest production technologies, while others will be deprived of similar advances in civilization [4]. This will cause new factors that will affect the stability of society.

A stable society is a society that is developing but at the same time maintaining its stability; a society in which the mechanism of change in terms of external and internal influences is established. The high stability of society implies a high level of resistance to undesirable disturbances both inside and outside the social system. Social stability is based on a set of unstable equilibria between system-forming and system-destructive processes [22]. The emergence and development of cyberspace can act as a systemic and systemic factor in the stability of human society. In view of this new challenge for futurology, there is a need to involve additional tools, perhaps in the fields of psychology or pedagogy, for the analysis of adequate conclusions to determine the prospects for the coexistence of the human and machine environment.

Modern analysis of the philosophical and methodological base of forecasts has revealed fundamental differences in the approaches to the predictt ion of theoretical and applied futures. The theoretical futurology, aimed at creating a holistic image of the future, is characterized by the appeal to the traditional principles of forecasting, known since the XIX and even in the XVIII century. And applied futurology, which uses the latest methodological developments and knowledge of applied sciences, offers only plausible forecasts of particular areas of the near future [23]. In the modern world, the subjectivity of the researcher has undergone significant changes. Previously, as a rule, the direction and nature of the study was predominantly determined by the subjective ideas of the scientist about the nature and methods of scientific search, and determined by the basic hypothesis. In modern times, the organization of foresight involves not only coordination of joint efforts of a group of scientists, but also taking into account the wishes to confirm or

refute the ideas of the customer (state, large corporations, etc.) about future phenomena and processes. The focus of such a customer, mainly on the fragment of interest that is interesting to him, not only determines the geographical boundaries and subject field of study, but also the level of scientific abstraction. This is due to the fact that quite often the customer is only interested in the regional level forecast, and the impact of a particular activity or inaction on a larger scale is beyond his interests.

In addition, the modeling of the future is based on different ideas about the identity of customers and is often conducted precisely to change the level of subjectivity in the area of important decisions. This approach may contribute to the fact that modeling the future in the interests of, for example, several regional actors may lead to a completely different version of the perspective precisely through attempts to implement mutually exclusive options for the development of future phenomena [24]. In this case, when modeling the future, it is necessary to take into account not only the available data, but also the possible variants of future change initiated by opponents. It should also be noted that such variations should also include changes in the environment that are significantly affected by the increase in atmospheric pollution due to the economic activity of a number of leading world manufacturers. The impact of climate change on future phenomena and processes is all the more difficult to predict, the more widespread their dynamics are. The increasing rate of environmental transformation under the influence of human activity inevitably leads to the aging of a number of forecasts.

The growth dynamics of change in the modern world causes the transformation into capital not only of the information itself, but also of the speed of its transmission and processing. In this regard, the productivity of research centers and teams of researchers involved in a sort of "arms race" in the field of information processing speed is increasing. And here the possibilities of artificial intelligence can not only surpass human, but also create precedents, when the logic of accelerating the implementation of the necessary calculations can help to form a conclusion about the need to eliminate a person from forecasting. This can lead to the use of artificial intelligence methods for predicting the future, not only inaccessible to humans, but also those that do not take into account the part of the subjectivity of the research process, which is now associated with "humanity". It is this fact that raises concerns about the widespread involvement of artificial intelligence in futuristic research, since machine (formal) logic may dictate decisions that are logical within a particular (local or regional) task, but are totally unacceptable given the interests and needs of all humanity.

Humanity’s perceptions of the benefits of democracy can be fundamentally rejected, since the criterion of correctness or prudence can be determined not by the level and quality of consensus, but by the access of certain artificial intelligence to the disposal of certain resources. In this case, futurology can turn from a science of humans for humans into a means of

machine modeling of the future.

It is possible that an awareness of such perspectives has recently led researchers to think more and more about the meaning of human existence in the future. The proliferation of anthropocentrism in futurological research is likely to be driven by an awareness of the inability to compete with artificial intelligence in the speed of information processing and concerns about the prospects of using assessment categories by techniques that will be guided by artificial intelligence itself.

Alvin and Heidi Toffler emphasized the prospect of collective knowledge accumulating through computers "in mega minds and at a rapid rate of accumulation in the future" [25, p.163]. Researchers emphasized that knowledge loses its accuracy every half a second, and therefore "the burden of old knowledge", which turns into "waste," weighs. Therefore, if, based on outdated data and with the growths of a mass of false knowledge, poor decisions are made, then they become the basis of an "error economy". Accordingly, forecasts based on unreliable knowledge will inevitably lose their relevance. Therefore, researchers have updated the problem of access to modern knowledge in order to provide the best opportunities for involving people in the analysis of information.

One of the manifestations of the spread of anthropocentrism can be considered increasing attention to the study of irrational human behavior. Economic and social projections have long been derived from a rational approach: individuals in the pursuit of the greatest benefit will behave the same that is, projected. But Orthodox economists do not take into account that people’s lives are not reduced to the maximum satisfaction of economic interests only. Empirical psychologists have argued that "the model of rational behavior under uncertainty is not simply sufficiently conditional, but quite unsuitable for the description of reality," which reveals many deviations from rationality. Therefore, a linear prediction model based on knowledge of past events can be confusing, and the same data can serve as the basis for the opposite conclusions. Therefore, N. Taleb considered it necessary to critically treat their knowledge and to recognize the possibility of error, especially because of the complexity of understanding the "asymmetry of past and future" [26, p. 302]. It is possible that a person’s fundamental ability to critically evaluate his or her actions and reject the feasibility of implementing the seemingly most rational or reasonable decision on the basis of the ability to predict or anticipate may be an important factor that will complement the speed of information processing for predicting the future by artificial intelligence. The prudence and "sense of the future" based on the irrationality of feelings is important in the "competition" for the right and expediency of modeling the future. We believe that reducing the predictability of humans only to the specifics of certain brain chemical reactions that can be analyzed is inaccurate. The basis for such a statement is the fact that modern man uses only the limited capabilities of his brain. In addition,

a widespread model of artificial intelligence development based on their acquisition of human emotions or feelings is one of the most common models of technology development in the future. It proceeds from the fact that the combination of human and artificial intelligence capabilities is more rational for both categories of thinkers than the seeming over-rationality of artificial intelligence, the result of which, as a rule, predicts the death of mankind in the wake of robots.

The introduction of the term "behavioral economics" and the increasing efforts in the field of analysis of the emotional component of human decision-making is probably a response of the person to the "attempt" of artificial intelligence to undermine human monopoly in the field of scientific analysis. At the same time, it is possible that the irrationality of man and the rationality of artificial intelligence will prove to be the unity and struggle of opposites that will determine the further development of civilization.

Conclusion. At the beginning of the XXI century there was a need to investigate man and his place and role in ensuring technological progress not only in the growth of the influence of technical means on the development of mankind, but also in the conditions of development of physical integration of technical means into the human body to enhance its capabilities. Earlier, people improved mechanisms based solely on their needs, then in modern conditions, due to the development of neurosensors, prerequisites for self-development of technology without human involvement, as well as for the impact of technical means (including artificial intelligence) not only on the locomotor apparatus human, but also in the process of its thinking. The nature and extent of the use of technical means in the human body has put on the agenda the need to adjust the research methodology to determine the most appropriate options for studying the symbiosis of man and technology.

The reality of the XXI century in fact, there was a need for widespread use of synergistic research in the field of economics. Technical capabilities, including the transfer and processing of information, have become an important factor for promising transformations in the field of finding adequate models of scientific search in the field of futurology. The work of individual "factories" or the use of foresight is no longer in line with the realities of the times. It requires the cooperation of diverse researchers from many countries to make synthetic solutions that would define human development prospects not only in the field of production, but would be complex in nature. A synergistic approach can also act as a means of demonopolizing the world market, providing greater chances for economically backward countries, but at the same time eliminating the prospect of a bloody confrontation between rich and poor nations through the redistribution of raw materials.

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Ніколаєць К. Футурологічні концепції інформаційного суспільства.

Постановка проблеми. *У сучасних умовах спостерігається відхід футурології від створення глобальних проектів майбутнього існування людства з одночасним переходом до розробки конкретних питань і прогнозів у певних сферах життєдіяльності людини. Прикладний напрям футурології знайшов своє відображення у реалізації прогностичної функції багатьох суспільних наук. Реалізація такої функції вилилася у науково-технічне, природознавче та суспільствознавче прогнозування. Задля підвищення наукового рівня футурологічних прогнозів відбувалося постійне вдосконалення методичного інструментарію, що зумовлювалося специфікою використання науки.*

Аналіз останніх досліджень і публікацій *показав, що попри наявність окремих наукових студій, автори яких висвітлюють перспективні напрями розвитку футурології, у сучасний період відсутнє дослідження, присвячене аналізу новітніх методів наукового пошуку, актуальних в умовах зростання значення прикладних функцій науки.*

Метою *дослідження є визначення основних напрямів розвитку футурології на сучасному етапі в умовах поглиблення процесу глобалізації та характеристика новітньої методологічної бази футурологічних досліджень.*

Матеріали та методи. *У дослідженні за дотримання принципів об'єктивності, поєднання історичного та логічного аналізу використано орієнтаційно ціннісний, статистичний та біхевіористичний методи наукового пізнання, метод наукової абстракції.*

Результати дослідження. *У сучасному світі суттєвих змін зазнала суб'єктність дослідника. Раніше, зазвичай, спрямування і характер дослідження переважно обумовлювалися суб'єктивними уявленнями науковця про характер та методи наукового пошуку і визначалися основними положеннями гіпотези. Наразі організація форсайту передбачає не лише координацію спільних зусиль групи вчених, а й врахування побажань щодо підтвердження чи спростування уявлень замовника (держави, великих корпорацій тощо) про майбутні явища та процеси. Сконцентрованість такого замовника переважно на цікавому для нього фрагменті найближчої перспективи не лише визначає географічні межі та предметне поле дослідження, а й рівень наукової абстракції.*

Висновки. *На початку XXI ст. постала необхідність досліджувати людину та її місце і роль у забезпеченні технічного прогресу не тільки за зростання впливу технічних засобів на розвиток людства, а й в умовах розвитку фізичної інтеграції технічних засобів до людського організму для розширення його можливостей.*

Реальністю XXI ст. фактично стала необхідність широкого використання синергетичних досліджень у царині економіки. Технічні можливості, у тому числі передання та обробки інформації, постали важливим чинником перспективних перетворень у сфері пошуку адекватних моделей наукового пошуку у царині футурології. Робота окремих "фабрик думок" чи використання методу форсайту вже не відповідають реаліям часу. Потрібна кооперація різнопланових дослідників з багатьох країн для ухвалення синтетичних рішень, які б визначали перспективи розвитку людства не лише у сфері виробництва, а мали б комплексний характер.

Ключові слова: футурологія, моделювання, штучний інтелект, форсайт, синергетика, наукова абстракція.