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EVOLUTION OF KNOWLEDGE FORMATION – A GLOBAL VECTOR OF HUMAN DEVELOPMENT AND ITS CONTRADICTIONS

The article noted the significant contribution to the development of scientific thought regarding the formation of knowledge by V. Vernadskyi, who predicted the transition of the biosphere into the noosphere, thus pointing to the role of intelligence in the formation of knowledge. It is indicated that he was unable to definitively determine the mechanisms of such a transition due to a number of objective and subjective factors, namely: lack of full understanding of the role of information in the formation of the economy and social sphere, as well as the priority of information and communication technologies and computerization. However, V. Vernadskyi clearly noted the need to change the concept of human perception of nature and the environment. Economically, knowledge shapes the development of the modern economy at the level of countries and regions: the contribution of knowledge to the level of GDP reaches 50%, and the stimulation of economic growth is at the level of 60–70%. Due to the informatization of knowledge, it appears in the modern economic environment as crowdfunding.

The main achievement of our research is the discovery of the evolutionary regularity of the dynamics of knowledge formation. If until the 21st century, knowledge was accumulated relatively slowly and in an insufficient amount and exclusively within the scientific research of individual talented researchers, then since the 21st century, knowledge has taken the form of a large-scale nature. Therefore, a separate stage is marked – the economy of knowledge. At the same time, knowledge is formed both in the scientific environment and in production, ie in close mutual integration.

The role of intelligence in the formation of knowledge is monitored. It is noted that the initial intelligence originated in the biosphere. In the future, this led to the formation of artificial intelligence. Accordingly, it is indicated that artificial intelligences cause conflict, which manifests itself as a violation of the biosphere.

The article raises an extremely complex problem of humanity, which concerns the conflict between human and artificial intelligence. At the same time, artificial intelligence in the process of development forms an artificial information processing system that cannot be evaluated by human reason and logic. The concept of harmonious cooperation of these intelligences, which will lead to the automatic full control of the knowledge of mankind and will determine the implementation of such knowledge, is also noted.

Keywords: knowledge; knowledge economy; intelligence; artificial intelligence; noosphere; intellectual capital.

Formulation of the problem. Knowledge is the basis and achievement of humanity. Due to the development of human intelligence, the harmonizing mechanisms of the planet Earth were disrupted, namely, the protective mechanisms of the biosphere are unable to fully restore the protective mechanisms of the biosphere. Human began to dominate the processes of nature and subjugate biological and mineral resources to the ever-growing needs of mankind, and as a result there is pollution of nature, as well as certain zones (territories) completely unsuitable for human habitation (Chernobyl zone) and new diseases and disorders of human reproductive function due to chemistry, use of radioactive and unnatural products. The development of intelligence changed the traditional principles of spirituality, love, and respect for nature to new ones – a comfortable life, the struggle for extra profits and the conquest of both territories and people. In fact, humanity has entered a new era of slavery, in which a small number of people rule all of humanity through money.

Therefore, the transition from the biosphere to the noosphere requires solving a powerful layer of humanity's problems, because man transforms the entire earth and the surrounding space with his own intelligence, while destroying the mechanisms of nature and the task of intelligence, according to V. Vernadskyi, is precisely the creation of new rules for preserving the earth for future generations.

The problem of increasing knowledge leads to the replacement of human intelligence with artificial or machine intelligence. And this, in turn, leads to the formation of a point of singularity, namely the appearance of a mind that is not subservient to a person and disposes of itself without human intervention. At the same time, a person is faced with the dilemma of competition with the product of his work. Therefore, human logic will not be able to predict the logic of fast self-developing artificial intelligence.

The relevance of the research topic is explained by the fact that knowledge is the source of human development. If until the 21st

century, knowledge was accumulated rather slowly and was a priority of a small number of scientists, then at the present time, the availability of information in the entire sphere of human life makes it possible to obtain it instantly. From the standpoint of their formation, there is an increase in their intensive accumulation in various forms – methods, laws and regularities, and technologies. At the same time, the time from the formation of knowledge to their implementation has been extremely reduced.

Analysis of recent research and publications. Scientific works of foreign scientists: P. Drucker, F. Fukuyama, S. Kramer, L. Leidesdorff, P. Romer and others are devoted to topical issues of the formation and development of knowledge and its components. The Economy Knowledge Index, developed by experts of the World Bank, deserves special attention, which allows you to assess the level of development of the knowledge-based economy in different countries of the world, based on its own methodology.

The role of knowledge was assessed by a great scientist V. Verdanskyi. He developed a concept at the level of worldview of the noosphere and pointed to the need for intellect.

Formulating the article goals. The purpose of the study is to follow the development of the humanity's transition from the biosphere to space and the inner unity between humanity and nature in the near future. V. Vernadskyi noted a special tool for the development of the biosphere, inherent in the biological subject – human, namely the system of knowledge and assessed the vector of such development from the standpoint of preserving humanity on planet Earth. The tasks of the research are:

1. To investigate the impact of knowledge on the intellectualization of human labor through the economic dimension.
2. To analyze the development of informatization of society as an aggravation of unresolved problems of morality and faith during the transition of humanity into the noosphere.

The main research material. In general, the 21st century was marked by the intellectualization of work (management of intellectual human capital), an intellectual approach, an increase in the volume of intellectual work in the total volume of work, and the formation of knowledge workers, which is characteristic of the 5th technological system. Its basis is oil and gas energy, microelectronics, personal computers and the Internet, biotechnology of microorganisms, information technologies and robotics. The beginning of 2020 indicated a transition to the management of intellectual abilities (potential) of employees. An innovative approach is fully manifested in it. In fact, the

6th technological order is being formed. A highly intelligent and creatively thinking person (employee) who knows how to pose new problems and solve them creatively becomes a key factor in production. Nanotechnology, global telecommunication networks, biotechnology of plants, animals, medicines, genetic engineering, photonics and optoinformatics are developing massively. The digitalization of the economy is being implemented in the information sphere.

If in the structure of the collective worker of the industrial economy (1–3 technological structures) the leading role was played by an employee of medium qualification, then in the collective structure of the worker of the information economy (4th technological structure) the work of a highly qualified worker is dominant. During the transition to the 5th and 6th technological order in the conditions of the innovative economy (knowledge economy), a qualitatively new generation of workers –knowledge workers, meritocrats – is formed and begins to dominate.

Meritocracy (from Latin «meritus» – worthy and Greek «kratos» – power) is the power of the most gifted. The term was introduced by the English sociologist M. Young in the book «The Rise of Meritocracy: 1870–2033» (1958) [1]. They are not just highly qualified professionals, but also have a developed creative intelligence, adapted to any working conditions and their changes, as well as the ability to quickly change the profession, cultural and social environment, to highly productive work, self-discovery and self-improvement.

Studies of the dependence of labor productivity on the level of education showed that with a 10% increase in the level of education, labor productivity increases by 9%, and with a 10% increase in equity capital, labor productivity increases by only 4% [2].

This explains the increase in the share of intellectual costs in production compared to material costs. Indeed, just as the value of many high-tech goods is absolutely incomparable to the value of the materials and components from which they are made, the value of modern high-tech companies is often determined only to a lesser extent by the value of the tangible assets of the company: material, financial or monetary. Currently, a person is not only a carrier of new knowledge in the NTP, but also a creator of new knowledge, which is confirmed by a change in the approach to building models of the functioning of macroeconomic systems. Technological changes are included as endogenous variables reflecting phenomena that occur within the system rather than being introduced from the outside.

Following J. Schumpeter, evolutionists R. Nelson, S. Winter focused attention on the evolution of subjects of economic activity as the

causes of changes in the economic system as a whole [3]. Innovations, discoveries, learning took a central place in the description of the mechanisms of evolution. Representatives of the "new theories of growth", P. Romer and R. Lucas, began to consider scientific and technological progress as an internal, endogenous factor of economic growth and largely relied on the concept of human capital [4]. R. Lucas adds the factor of intellectual capital to the classical equation of the Cobb-Douglas production function and explains the success of South Korea and Taiwan in the field of economic growth with the help of the obtained model. The lack of physical and material capital is compensated in these countries by a high level of intellectual resources [5]. P. Romer develops a model of the knowledge industry, which ensures economic growth by producing new ideas. The accumulation of human capital is considered by "new theories of growth" as a result of the activity of the education system. On the other hand, the education industry uses human capital as an investment.

Economists R. Solow and P. Romer noted that in general, only 50% of GDP growth can be explained by the growth of labor resources and physical capital, and the other 50% is accounted for by intellectual capital [6; 7].

The example of Japan's purchase of technology abroad is illustrative. Japan is one of the most innovation-oriented countries in the world, for 43 years (1968-2009) it held the second place in terms of GDP, second only to the USA. From 1950 to 1964, Japan purchased 2,563 licenses abroad, on the basis of which 11% of industrial production, 17% of export goods, and 10% of gross capital investment were carried out, while Japan overtook Germany in the volume of license purchases. As a result, the production of products under licenses in Japan during the period from 1950 to 1960 grew by an average of 72% per year; if during this period the rate of development of the Japanese economy (GDP growth) averaged 21% per year, then without the purchase of foreign technology, according to the magazine "Oriental Economist" (USA), it would have been less than 20% [8]. Only in 2010, China with an indicator of 5.88 trillion. dollars surpassed Japan (5.47 trillion dollars). But at the same time, one should not forget that the population of China is 10.5 times larger than the population of Japan (127.3 million).

According to the results of research by the World Bank, only 15–16% is physical capital, about 20% is natural and 65% is related to human and social capital [9].

Research conducted in the EU countries showed that enterprises that partially use intellectual capital receive an average of 14% of profit,

those that use it more actively – 39%, and those enterprises that consider intellectual capital as the basis of strategic development – 61%. According to E. Denison's calculations, investments in intellectual capital give a return 5–6 times higher than in material production [10].

It is generally accepted that during the entire period of his professional activity, a specialist should improve his qualifications 5–8 times. The National Science Foundation of the USA, in particular, recommends that specialists devote 10 hours a week to studying literature in their field and 40–80 hours a year to participate in any form of continuing education [11].

Inattention and disdain for employees, underestimation of their mental and physical abilities, reduction of state and business spending on training and retraining of personnel in no way contributes to the development of intellectual capital, restrains and devalues it. With this approach, the question of forming an innovative type of economy is raised. An innovative economy involves people with high intelligence.

In the information economy, intellectual capital becomes key in increasing labor productivity and increasing the value of the company. Experts believe that the ratio of intellectual capital to the cost of material assets in high-tech companies should be in the range from 5 : 1 to 16 : 1.

In modern theories of intellectual resources, two directions can be distinguished. The direction related to the consideration of the intellectual capital of an individual and a separate enterprise is most widely and theoretically fully presented. In the second direction, it is possible to combine "intellectual" concepts of national wealth and economic growth, as well as methodologies for assessing the intellectual capital of society.

Economist J. Kendrick [12] highlighted a number of problems when considering intellectual resources as a factor of national wealth and growth:

- formation of intellectual resources is ensured;
- young industries that have recently taken a place alongside the industries of the real sector;
- the interaction of industries that produce intellectual resources with the real sector does not fit into the usual scheme of market relations;
- the value assessment of intellectual resources at the macro level is extremely complicated;
- expenses on intellectual resources are long-term investments.

In the first half of the 2000s, research on intellectual capital in the regions intensified. The first works in this field pursued such goals as:

- study of relationships between elements of intellectual capital;
- study of its impact on the economic development of countries;
- definition of indicators that can be used to measure intellectual capital.

Some theses, developed within the framework of theories of intellectual capital development, touched on the aspects of its delocalization on the territory of the country in order to reduce disparities in the development of its individual regions.

A significant part of the works did not pursue management goals, focusing on the issues of connecting intellectual capital with the economic development of the region and finding approaches to its assessment. At the same time, the assessment of intellectual capital was carried out for various purposes, including and in order to demonstrate achievements in the field of knowledge economy. For example, the work "Intellectual capital of the state of Israel: 60 years of achievements" [13], presented by the Israeli Ministry of Industry, Trade and Employment, has a similar character.

Later studies touch on the issue of knowledge management in the region, considering intellectual capital as a factor of innovative development. The works of Italian researchers J. Shiuma, A. Lerry and G. Carlucci can be noted among such studies. According to the interpretation proposed by the authors, intellectual capital is understood, first of all, as knowledge, implicit and codified, and is the basis of innovative development, being its main resource [14] (Fig. 1).

Modern economic science pays attention to the fact that the influence of human resources on the level of production is qualitatively different from the use of tangible assets of enterprises and organizations. Indeed, obtaining high performance results requires the use of highly skilled labor, state-of-the-art equipment, fairly high financial investments and high-quality natural resources, which are limited to the greatest extent. Intelligence gives labor a new qualitative state: the product is created practically without the participation of other ordinary factors of production. In the information society, the intellectual potential of a person becomes the main means of production. And this means of production belongs inseparably to the worker himself, so the value of high-quality labor resources increases sharply.

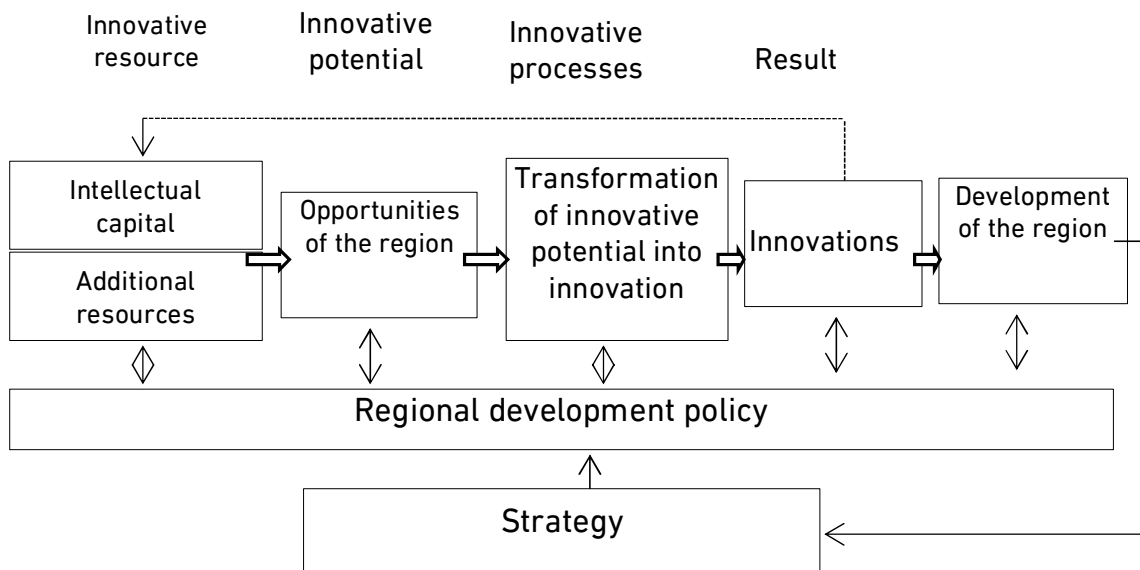


Fig. 1. Intellectual capital in the system of innovative development

In the conditions of constant updating of knowledge, innovative transformations and fierce competition, employees are faced with the need for continuous training throughout their lives. On the other hand, along with the change in the types of economy, there is a reorientation of human needs: from material needs in the conditions of an industrial economy to needs for social guarantees (education, health care). In the post-industrial economy, the need for creative, innovative work, comprehensive development and social recognition in the knowledge economy (innovation economy). The new system of social guidelines was called «post-economic», which corresponds to the awareness of an increasingly significant part of employees of their interests not so much in the sphere of material goods, but from the point of view of internal development and intellectual growth. Fierce competition not only generated a growing wave of innovation, significantly increased the number and variety of high-tech goods and services, but also significantly shortened the life cycle of innovation. The strategy of accelerated replacement of goods and services is becoming typical for many industries. In some sectors, for example, in the information technology sector, firms must constantly update their products just to maintain their market positions.

Informatization of society has become a common phenomenon for every person. At the same time, by working in a computer network, a person receives information that great scientists could not accumulate in their entire lives. The information environment transforms the

essence of a person, while ethnic, cultural, national, and religious traditions are being eroded. In the global information system, a person begins to exist in all cultures and begins to be in deep individuality, deep loneliness, which is not connected to the real world. At the same time, a self-contained abstract virtual world created by him is formed, which is not connected with the realities of the individuality of another person. That is why drug addiction, game addiction, suicide flourish, and in general, human values are lost. A person becomes unnecessary to a person – the vitality of humanity as a species is lost as a whole.

In technical terms, information systems change the environment of business and economy. Thus, General Electric experts, for example, believe that changes are happening so quickly that forecasting the future becomes practically impossible. Therefore, in the innovative economy, instead of long-term planning, the speed of the company's response to market challenges, the ability to quickly adapt to changing conditions of activity comes to the fore. At the regional level, the key strategy for ensuring the competitive development of the territory is the creation of its own value chains based on unique product brands obtained through the implementation of regional innovation projects – the results of human intellectual work.

In the conditions of the innovative economy, human capital is considered as a strategic resource. One can agree with T. Peters, R. Waterman, P. Drucker, J. Naisbit, P. Abardina, N. Gorelov, along with other researchers, that the quality of human resources is becoming the main tool of competitive struggle in the XXI century. It is not by chance that N. Bontis, J. Malkhorta and a number of other researchers move from the assessment of the company's intellectual capital to the assessment of the company's intellectual capital [15–16].

Model of intellectual capital of society (Fig. 2) represents the transfer of the organization's characteristics to society as a whole. In the presented model, client capital is transformed into market capital, which reflects a complex system of market interactions of many "clients" and "sellers"; innovative capital becomes restorative and includes everything related to the future intellectual wealth of society.

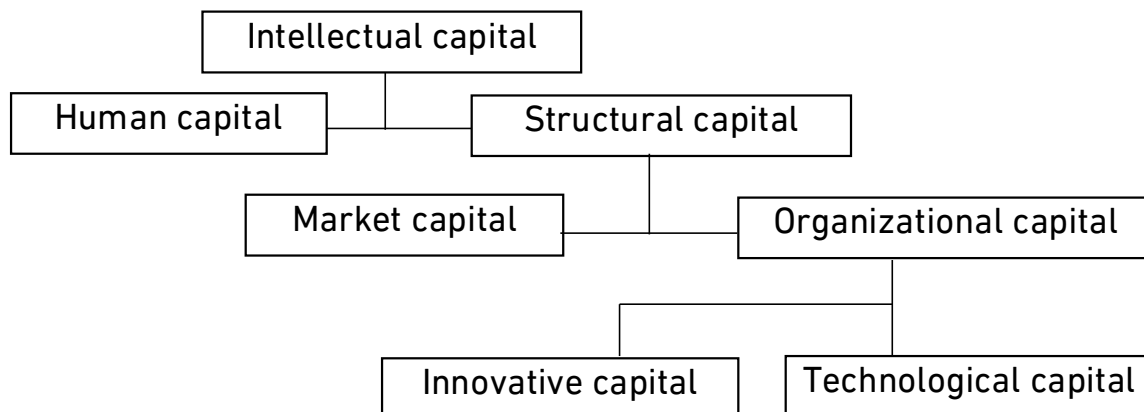


Fig. 2. Model of intellectual capital of society

Practice confirmed the theoretical research of scientists and proved the dependence of the economy on accumulated human capital and the nature of its use.

In the period of informatization, intellectual capital manifests itself through crowdfunding (crowd – crowd, funding – financing), which involves the participation of a large number of people to accumulate funds for a specific business idea. This allows you to bypass various instances in the received series of various permits and launch the project for an already formed target group of consumers. At the same time, the crowd project is the implementation of know-how.

Patenting as the embodiment of intellectual capital in business relations is supported by a trademark and a brand. For the first time since 2016, the first place in the ranking of the most expensive brands of Brand Finance Global 500 was taken by Apple, experts estimated this brand at \$ 263.4 billion. Its value increased by 87% in 2021.

Tesla became the fastest-growing brand, the valuation of which increased by 15.8% from 2020 to \$32 billion. The second place in terms of growth rate - +108% was taken by the Alibaba.com brand, which rose in price to \$39.2 billion [17].

In general, all this marks the intensified transition of humanity in the era of the noosphere from the biosphere. That is why there is a need to form and observe the latest human ethics. When the new rules of the game of humanity will have to control the development of technology and the development of knowledge and science in general. Noetics is the ethics of laws and rules, when the intellect of humanity controls scientific discoveries, determines the viability of scientific discoveries for development and use so that knowledge is not used against humanity itself. At the same time, every individual must be aware of his responsibility to nature and other people.

Today, intelligence has become a powerful force. V. Vernadskyi foresaw this. Therefore, he noted that if humanity manages to overcome it, humanity as a biological species will have a future. Otherwise, there will be a loss of nature and human from its scientific research and implementation. This warning becomes extremely relevant today, when there is a high probability of a nuclear war on the threshold.

It should be noted that V. Vernadskyi did not prove (underworked). If the biosphere is explained very deeply, then the role of the planet itself is presented to scientists as a basic element without the possibility of influencing the biocenosis. He did not define the planet as a thinking element, and its protective function is manifested as a reaction to changes in the conditions of the biocenosis. But from the point of view of intelligence, the planet is the birth of intelligence, which determined the structure of the biosphere and allowed the emergence and development of the most intelligent biological species – Homo sapiens (Fig. 3).

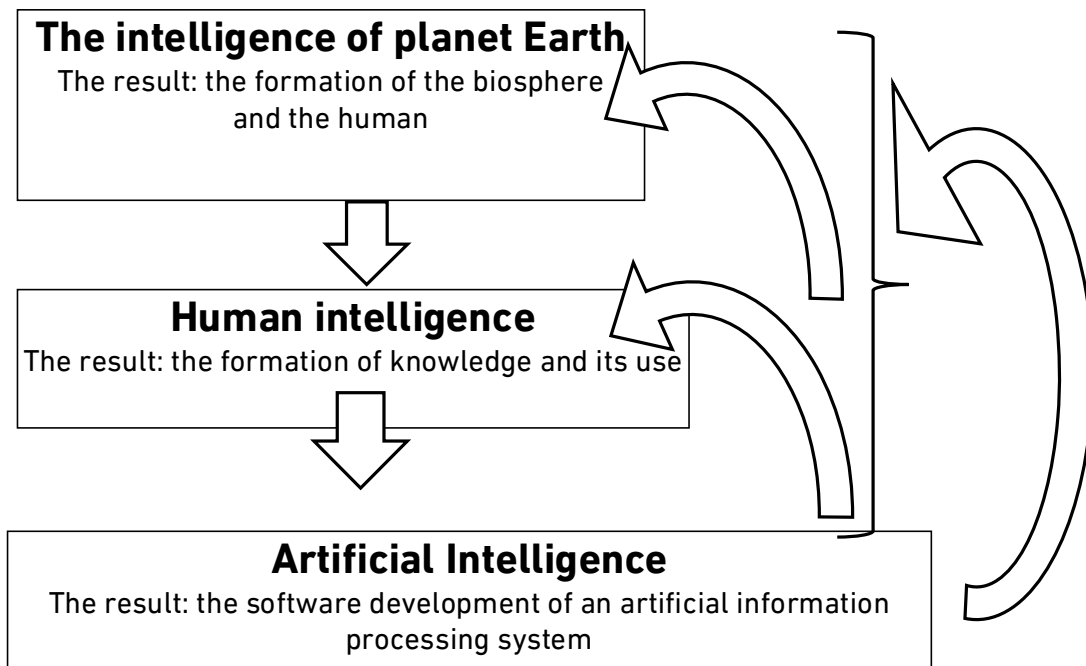


Fig. 3. Mechanics of dialectical development of knowledge and the emergence of contradictions

Human intelligence gradually began to dominate the natural world. A similar influence is already observed regarding the influence of artificial intelligence on human intelligence. And if we do not intervene in this dynamic development process of information and communication systems, then in the near future artificial intelligence will begin to dominate not only human intelligence, but also planetary intelligence. This will be the final end of the entire biocenosis, and therefore of

humanity and the planet from the point of view of natural development. However, the development of a planet without a biosphere will follow a completely different path according to the program code of artificial intelligence, and its logic can no longer be determined.

Thus, in the future, the work of the two intelligences of the human and planetary Earth will manifest itself. This cooperation will determine the priority or the last word in the practice of human knowledge, when the planetary intelligence will uniquely determine the realization of human knowledge. If the knowledge is favorable for humanity and the planet, then it will be implemented very quickly and with the intellectual addition of the planet. Otherwise, the creative knowledge of scientists will not only not be realized, but will be indicated as a dead end without further improvement.

Conclusions:

1. The transition to the XXI century marked a new resource for economic growth and development. It became knowledge. At the expense of knowledge, the 6th technological order began to form. Therefore, scientists celebrate the era of the knowledge economy. In industrial relations, meritocracy begins to dominate, which forms a new intelligence at the expense of self-knowledge and self-improvement.

2. The modern economy of countries develops at the expense of intellectual capital, which provides 50% of the GDP growth of the national economy. Economic growth is determined by 65% of human and social capital. Therefore, intellectual capital is nothing more than knowledge implemented in the economy.

3. Informatization of the society is manifested both in the economy and in the social sphere. Definitely, the information systems of the economy have ensured a prompt response of economic revenues to the dynamic changes in the market environment. In the social sphere, destructive phenomena are blamed, which inspire people from society and bring them to virtual reality. It's a pity that they directly dominate the modern development, but bring the spirituality of human society to a crisis. The very same distructural tendencies became more prominent during the transition of people in the 21st century. Although in the economic environment for informational purposes, intellectual capital manifests itself through crowdfunding.

4. This development of the economy and society became possible due to the formation of human intelligence. At the same time, the intellect itself underwent a long evolution and became the driving force of the development of human society. However, its negative dynamics manifested itself, which leads to an increase in the threat to the existence of the planet's biosphere. And such trends were foreseen by

V. Vernadskyi more than a century ago. He noted the way out of such a situation through the formation of the noosphere based on morality and human's love for all living things.

5. However, the development of informatics systems made it possible to form artificial intelligence. A clear trend stood out – the development of the biosphere shaped human intelligence, which began to press and negatively affect the entire biosphere of the planet. The very development of human intelligence contributed to the introduction of artificial intelligence through the development of informational neurosystems. This intelligence, by analogy with the human, begins to dominate the human and takes the person from the first positions to the object of his management and dominance in development. Such dynamics of its development will lead to its complete control of man and nature or the entire biosphere.

6. The way out of this situation is to prioritize the development of humanity through spirituality and morality. There is a need for the implementation of Noetics, namely the observance of laws and rules, when the intellect of mankind controls scientific discoveries, determines the viability of scientific discoveries for the development and use of the acquired knowledge in order to prevent negative and destructive tendencies of its manifestation for all living things. And this is the first step in solving the harmonious development of the biosphere and noosphere of our planet.

7. The next step in the evolution of human intelligence will be the cooperation of two intelligences, human and artificial, which will form a single planetary intelligence of the Earth. At the same time, such cooperation will determine the priority or the last word in the practice of applying knowledge. The creative task of a human researcher and scientist will be reduced to the discovery of regularities and a methodological description of technologies, and the intelligence of the earth will already indicate the viability of these technologies in implementation. This very moment was not elaborated in detail by V. Vernadskyi, although the idea of this is manifested in his explanation of the concept of the transition from the biosphere to the noosphere.

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ЕВОЛЮЦІЯ ФОРМУВАННЯ ЗНАНЬ – ГЛОБАЛЬНИЙ ВЕКТОР РОЗВИТКУ ЛЮДСТВА ТА ЙОГО СУПЕРЕЧНОСТІ

У статті відзначено значний вклад у розвиток наукової думки щодо формування знань В. Вернадського, який передбачив перехід біосфери в ноосферу, тим самим вказав на роль інтелекту у формуванні знань. Проте він не зміг кінцево визначити механізми такого переходу через ряд об'єктивних та суб'єктивних чинників, а саме: відсутність повного розуміння ролі інформації у формуванні економіки та соціальної сфери, а також пріоритет інформаційно-комунікаційних технологій та комп'ютеризації. В. Вернадський чітко відзначив необхідність зміни концепції сприйняття природи та навколишнього середовища людиною. В економічному плані знання формують розвиток сучасної економіки на рівні країн та регіонів: внесок знань у рівень ВВП сягає 50%, а стимулювання економічного зростання на рівні 60–70%. Інформатизація знань проявляється у сучасному економічному середовищі як краудфандинг.

Головним здобутком дослідження є вияв еволюційної закономірності динаміки формування знань. Якщо до 21 століття знання

накопичувалися відносно повільно та в недостатньому обсязі і виключно в межах наукових досліджень окремих талановитих дослідників, то з 21 століття знання набули форми масштабного характеру. Тому відзначається окремий етап – економіка знань. При цьому знання формується як у науковому середовищі, так і у виробництві, у тісній взаємоінтеграції.

Відслідковано роль інтелекту у формуванні знань. Відзначено, що початковий інтелект зародився у біосфері. В подальшому це призвело до формування штучного інтелекту. Відповідно вказано, що штучний інтелект спричиняє конфлікт, а це проявляється як порушення біосфери.

Стаття піднімає надзвичайно складну проблему людства, яка стосується конфлікту людського та штучного інтелектів. При цьому штучний інтелект у процесі розвитку формує штучну інформаційну процесорну систему, яку не в змозі оцінити людським розумом та логікою. Відзначено і концепцію гармонійної співпраці цих інтелектів, що призведе до автоматичного повного контролю знань людства та буде визначати реалізацію таких знань.

Ключові слова: знання; економіка знань; інтелект; штучний інтелект; ноосфера; інтелектуальний капітал.

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