

Intellectual Potential of Ukraine: Realities and Prospects of Efficient Use in the Knowledge-Based Economy Conditions

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Abstract

The article deals with the problem of finding a new paradigm of socio-economic development of the economy in Ukraine. It is consolidated that a knowledge-based economy is characterized by knowledge-intensive, comprehensive intellectualization of social production, social orientation and becomes a practical shape in economically developed countries as the priority of economic policy. It is accented on the fact that knowledge and intellect will become the main driving force behind value creation. The center of attention is devoted to problems of development and effective use of intellectual potential and its components, and their role in the economic growth of the country. They are determined intellectual potential activation tendencies as the basis of socio-economic development at the conditions of becoming a knowledge-based economy, with the subsequent evaluation of this process effectiveness. The interrelation and influence levels of life and health upon the intellectual potential of society, the performance of intellectual innovation activities and economic growth were justified. It is proved that in the new paradigm of social development the main social goal should be the human and his development – intellectual, cultural, labor, spiritual, moral, social. The role of the human in the economic system requires consideration not only as a key element of the process of production and management, but also a powerful and promising resource that has huge potential and ability for self-development. There are outlined specific measures of political leadership and business elite in Ukraine concerning the intellectual potential of Ukraine intensification in conditions of the knowledge-based economy formation.

Keywords: *knowledge-based economy, Ukraine, intellectual potential of society, human capital, the impact of scientific and technological activities, economic growth.*

I. INTRODUCTION

In the history of world civilization development, transition into the 21st century was marked by a qualitatively new wave of cardinal transformations in the global economic system – there was a change in the paradigm of social progress, under which the factor of human progress became a condition, purpose and driving force of development. There is a growing understanding of the fact that the modern knowledge-based economy is not a continuation of the world development trend, but a fundamentally new phenomenon, leading to a radical change in the fundamental foundations of the economy and society in general, the emergence of a new social and economic development paradigm, requires a new paradigm of scientific knowledge. In other words, it is another world, another social system, a new system of economic relations, another consciousness, another principles of worldview, another time frames related to dynamism and the model of living space. Therefore, one of the vectors for the development of the knowledge-based economy concept, which helps to prevent the acute conflict of post-industrialism, should be a model of economy, which is based on fundamentally new approaches, new thinking, perception, a new philosophy.

This brought to the world economic opinion the actual tasks of developing the tools for building the knowledge-based economy, modernizing of national innovational systems and venture institutions, developing and disseminating computer informational and business communicational technologies, as well as enhancing effective practical implementation and self-growth of intellectual potential. The beginning of the 21st century reaffirms, that the current model of socio-economic development will in the future be increasingly based not on traditional natural and material supply, but on the latest knowledge and information that can significantly replace the traditional types of material, labor and financial resources involved for doing business. In other words, this paradigm is based on a new quality of knowledge, peculiar technologies for their generation and dissemination, as well as increased responsibility of the individual to society, future generations and the environment for the consequences of their business activities.

One of the characteristic global changes of modernity, that radically influences the management system is the uneven transition of different countries (nations) to the knowledge-based economy. The incipience of this economy and the formation of leading positions of creative work raise a number of theoretical problems, caused by the peculiarities of information products and technologies dominance era. In progress of the latest social, economic and institutional transformations, the role of the state, rules and forms of its participation in the economy, as well as mechanisms of interaction with the private sector are changing. The concept of the knowledge economy is gradually becoming the main theoretical policy basis of economic growth, revealing a new role and place of human intelligence in the information society.

Thus, the beginning of human civilization development third millennium is a kind of "psychological rubicon" that directs researchers of socio-economic development to a new quality of understanding the changes that are taking place. It is implied not an abstract research obligation, but an imperative to identify socio-cultural, economic and moral-economic conditions and factors, that determine the strategy for the development of civilization in the foreseeable future.

II. LITERATURE REVIEW

It can be affirmed that, in a general form, the knowledge economy theory as a holistic concept describing real changes in the modern economy is in the process of becoming and requires a comprehensive study and scientific analysis of this topic. The knowledge-based economy is an "umbrella" concept that allows one to gather existing ideas and concepts in science and innovations into one conceptual system[1]. This approach is quite problematic in terms of scientific austerity, but quite pragmatic in that it activates a huge field of activity for publishing new articles and organizing discussions.

The advancement of human and knowledge into the center of economic activity testified the need for a radical transformation of the cognitive process. The idea of a knowledge economy originated in the writings of F. Machlup [2], who in 1962 first used the term to characterize a new aggregate type of economic activity – the economic sector. In the following years, this pressing problem of modern civilization was developed in their writings Bell, 1967; Drucker, 1969; Toffler, 1970, among others [3; 4; 5]. Since 1990, there has been a renewed trend in the scientific community of this type of research, as evidenced by the increase in the number of publications in 1993-2002 more than in 26 times [6], and is constantly growing today. The actuality of the knowledge-based economy subject research is intensified due to the problem study insufficient degree caused, on the one hand, by its relative novelty, and on the other by the dynamic of the changes that are taking place.

According to theoretical and practical points of view, it is important to consider the knowledge-based economy as a result of economic evolution concepts and models growth in modern conditions. The definition of a knowledge-based economy is as follows: a new type of socio-economic development in which knowledge is a major factor and knowledge production is a source of growth (Jorde, Sidak and Teece, 1999; Geyets, 2004; Kolot, 2007, among others) [7; 8; 9]; a new technological level of management (Bazhal, 2004; Fedulova, 2005; Chukhno, 2010) [10; 11; 12]; a philosophical and methodological model of the future society, with the knowledge-based economy being an ideally unattainable socio-economic structure of the society most often promoted in the reports of UN commissions and world political figures [13]; an innovation economy that enables knowledge to generate a continuous stream of innovations that comply with the needs and most often form these needs (Schumpeter, 2008; Carayannis and Campbell, 2011, among others) [14; 15]; the science of knowledge-based economy that forms the platform for the development of intellectual capital (Stewart, 1991; Shevchenko, 2014, among others) [16; 17]. Thus, these approaches reveal the general essence of intellectual "diffusion" tendency in the modern society – the tendency of its economic intellectualization.

The aim of the study is the generalization of theoretical and practical experience, and to identify trends in intellectual potential activation as the basis of socio-economic development in a knowledge-based economy conditions, with a further assessment of this process effectiveness and the possibilities of its application in Ukraine.

III. METHODOLOGICAL APPROACH

The research methodology is based on the synthesis of general systems theory, theories of economic development, economic analysis and innovation. In order to achieve this goal, modern research methods are used, as well as the position that at the center of economic relations is a person, a community, collectives that have a certain spirituality, value, connections. The study of these relations aspects was conducted using trialectics, the concept of the three development forces. Human is seen as an entity, which has got a spiritual-bio-social nature, which forms the socio-spiritual formation (civilization), the ability to harmonize human interests as a major factor in the development of society, and the community (collective), which has got a social spirituality that also includes religious spirituality. This approach allows to reveal more fully the economic processes occurring in the domestic economy, its industry and economic entities in a changing paradigm and development vectors.

IV. CONDUCTING RESEARCH AND RESULTS

A. Challenges of technological evolution for Ukraine

The retrospective shows that the public of Ukraine continues to stay in the paradigm of evaluating a country, its economy as a large, industrial, with significant investment and innovative resources, a highly educated population, skilled labor and the ability to quickly catch up with the developed countries of the world, integrating into their system. Reality is far from illusions. The economy of Ukraine is characterized as small, commodity, de-industrialized, with falling markets, export oriented to low-tech goods, raw materials and labor, products with low added value, open, colonial type, which means, in particular, high dependence on external conjuncture and high sensitivity to foreign economic shocks [18]. Its economic mainstream was the principles of neoliberal theory and the orientations set by the Washington consensus: privatization, deregulation and liberalization, which from the very beginning did not correspond to the production forces, production relations and society spirituality, enterprises, human beings development level. The result of theoretical miscalculations was systemic socio-economic and structural economic crises that have hindered the development of society for almost three decades.

At the same time, let us acknowledge that there is an objective, technologically driven gap between countries with industrial economy, including Ukraine, and those with knowledge-based economy, which is quite difficult to bridge in today's economic environment. As a result, this gap is widened by a cardinal change in the defining resources of economic development: it is no longer a space with fixed production, but, first and foremost, the dominant mobile finance and intelligence. Thus, in order to intensify the process of transition from the burdensome realities of the industrial economy to the perspectives and possibilities of the knowledge economy, a clear coordination of actions aimed at modernization of the domestic economy and society in the scientific, technological, organizational and industrial spheres with domination of education, science and innovation is required.

This stage of technological evolution for Ukraine is both: a challenge and a "window for opportunities", the defining strategic vector of development, including the national human resources sphere, which is characterized by a lack of highly intelligent and innovative-competent staff from many perspective directions of high-tech industries development. The inability of a country to carry out structural restructuring of the national economy in accordance with the requirements of the new technological paradigm or delay with the implementation of such structural changes not only slows its development, but also leads to economic degradation. At this, the priorities are of "breakthrough" nature, which shape the new quality of the industrial basis of production processes. It is these end-to-end multi- and cross-sectoral trends mostly determine the relevance of technological change to global scientific and technological trends.

So, will this other world be able to get organized with such a poorly innovative economy as the CIS transition economies? The question is not rhetorical at all. The problem is that individual scientific or innovative "breakthroughs" (which the post-socialist society is so accustomed to) in the new conditions of the knowledge economy will not lead to significant changes at either macro or micro levels, since these "breakthroughs" are single and haphazard. The times, during which innovation has been identified as the main driving force for the socio-economic development of countries are passing. Not innovations (nowadays constant orientation to innovations is already taken as a concept, it goes without saying!), but knowledge, the system of their continuous changes is the basis of progress, a source of economic growth and competitiveness of the country. However, not knowledge embodied in products and services, but knowledge as such – fundamental and applied, reflecting the processes of development of economic, organizational, political systems of society, global problems of humanity, co-evolution with nature, the dynamics of human moral problems and many other issues.

B. Socio-economic and intellectual dimension of Ukraine

At the present stage of socio-economic development, the main source of national wealth is intellectual capital. The volume of intellectual capital directly depends on the intellectual potential of society – the totality of its members' ability to influence the noosphere basically with scientific, cultural and spiritual heritage of their mentality source. The intellectual potential of society is determined by such basic factors as: the quality of state socio-economic policy; genetic fund of the population; the quality of the living environment (standard and quality of life of the population, ecology, political climate, etc.) of the population in general and its individual groups in particular; the population health level; the younger generation upbringing and training system development level; the quality of population motivation mechanism to creative work; the structure of society and the employed population; the level of culture, spirituality and national consciousness of the population. Of course, these factors are interrelated and interdependent. In particular, the nation's genetic fund is irreversibly deteriorating under the influence of its unfavorable habitat; the population level and quality of life decreases due to miscalculations in the formulation and implementation of the state socio-economic policy, etc.

The need to become a knowledge-based economy, as a basis for socio-economic development in Ukraine, requires a critical analysis and assessment of the society intellectual potential. It should be noted that at present the Ukrainian economy does not fit into the context of modern scientific-technological and innovative development strategies of European socio-economic space. The positions of Ukraine in the global ratings are presented in Table I.

Table I: Positions of Ukraine in international rankings in 2019

Rating name	Organization or Source	Position*
HumanDevelopmentIndex, HDI	UnitedNationsDevelopmentProgramme	88 (189)
HigherEducationPriceIndex, HEPI	UnitedNationsDevelopmentProgramme	44 (189)
SocialDevelopmentIndex, SDI	SocialProgressImperative	80 (149)
The Global Innovation Index, GII	World Intellectual Property Organization	47 (129)
Global Competitiveness Index, GCI	World Economic Forum	85 (140)
Networked Readiness Index	World Economic Forum	60 (143)
Technological Readiness Index, TRI	World Economic Forum	78 (137)
The International Property Right Index, IPRI	International Intellectual Property Alliance	108 (125)

Source: TheGlobalInnovationIndex [19].

* The total number of countries in the rating is given in the brackets.

Such disappointing positions of the country in the above ratings are due to the fact that the component of the knowledge economy in Ukraine is receiving inadequate attention, its institutional environment needs considerable improvement, and its innovation and investment policy is not effective. There is no doubt that the economic policy of the Ukrainian authorities does not currently support innovative development of the state.

An important indicator characterizing the degree of intellectual development of the population is the Human Development Index, HDI, calculated under the auspices of the United Nations. The methodology for estimating the human potential index has several disadvantages. The most important of these are the independence of indexes-arguments, the uniformity of the domestic product gross (GDP) distribution among different segments of the population. The same statistics testifies the extremely low incomes of the intellectual sections in Ukrainian society (scientists, teachers, engineers and technicians). In addition, it is not possible to obtain the population of the country intellectual potential more objective assessment by the pointed methodology. One of the main reasons is the lack of its members life quality consideration, which significantly affects the level of their physical and mental development, and, as a consequence, the ability to create and use intellectual products, etc. Indicators such as the scientists and persons with higher education, students number in isolation from the indicators that characterize their quality of life, cannot uniquely characterize the intellectual potential of society.

C. The interrelation of social policy and intellectual potential

One of the main reasons for the decline of the society intellectual potential is the decrease in the level and quality of the population life, mainly its highly intellectual layers and the further deterioration of its physical and mental health.

Consider the relationship and impact of living and health levels on the intellectual potential of society, the performance of intellectual activity and economic growth. The level of the population health begins to increase (decrease) with some time lag as its standard of living increases (decreases). The intellectual potential of society, in turn, depends on the level of health (physical and mental) in the same way. As the intellectual potential of society diminishes, the performance of intellectual activity decreases (in this article, the focus is mainly on scientific, as much as scientific and technical activities), which subsequently inevitably leads to the emergence and recess of crisis tendencies in the economy. The zone of critical values characterizes the deceasing of life, health and intellectual potential of society and the performance of intellectual activity levels to the mark at which irreversible processes in society and the economy begin (lumpenization, extinction and degradation of society, giving up the positions not only in the world but also in the internal market for goods, works and services).

The standard of living. The fact that wages should be combined with labor productivity is not in dispute. However, in Ukraine, the cost of labor is extremely low, accompanied by low purchasing power of households. In particular, in 2019 the average nominal wage of the enterprises, institutions and organizations in Ukraine full-time employee was 10269 UAH (\$ 410), in the health and social care sectors 7020 UAH (\$ 280), education – 8135 UAH (\$ 325), science and scientific services – 11649 UAH (\$ 466) per month [20]. For comparison, in the USA, the monthly salary of a doctor is \$ 4964, a teacher – \$ 3764, an engineer – \$ 4268, a scientist – \$ 4333. And this despite the fact that the prices for basic goods and services in Ukraine are already close, and even exceed the ones in the US.

From this it is quite obvious to conclude that with such incomes, a large part of the country's population is unable to invest due to their low solvency in the development of their own human capital (for full and balanced nutrition, health care, culture, etc.). At the same time, the share of household costs on food purchases is more than a third part of the total consumer spending structure. The share of medical and sanatorium services in the overall structure of household costs in the first decade of the new century did not exceed 2%. Obviously, at this level of consumption of food, health and wellness services, it is difficult to preserve and promote the health of the nation.

The standard of health. Experts of the World Health Organization (WHO) calculated that the health status of the population of any country is determined by the following factors: socio-economic status of society (its contribution is 50-65%), quality of health care (it accounts for 10-15%), economic situation (its total impact

is estimated at 10-15%), heredity (its contribution does not exceed 15-20%). Into the first place, experts put the socio-economic state of society, which mainly depends on state socio-economic policy.

One of the serious deterioration of public health in Ukraine major causes is the acute health crisis. At the same time, the share of public expenditures decreased from 3.3% of GDP in 2018 and 3.2% in 2019 down to 2.9% of GDP in 2020. For example, in Austria, the share of public expenditure on health care averages 7.8%, Germany – 8.2%, Norway – 8.1%, USA – 6.9%, Sweden – 7.7%, Japan – 6.3% [21].

It should be noted that in recent years, health care funding from the consolidated budget has been allocated 7-10 times less than in was necessary to ensure the preservation and improvement of the nation's health and human development. Thus, the low health standard of the population naturally affects the intellectual potential of society and reduces the probability of building a knowledge economy. At the same time, the cumulative budget expenditures shows that social protection and security will be a significant article in reducing their volume in 2020: a decrease from 8.7% of GDP in 2018 and 8.3% in 2019 down to 7,0% of GDP projected for 2020 [22].

D. Education of Ukraine in the system of intellectual potential development

Competitive education, leading science and innovative technologies that harmoniously correlate with the cultural and spiritual heritage of the nation and the high moral values of society ensure the effective use of the intellectual potential of Ukraine.

Forming a space for new knowledge creation, as an independent and significant sphere of the general process of extended reproduction, is a key task of modern economic education. Unfortunately, the educational process in Ukraine persistently continues to serve the "old" economy, forming in a person the stereotypes of the need to accumulate a certain amount of "solid knowledge" in the field of relevant subjects of study. It is unlikely that this approach meets the requirements of today's economy, which requires not so much specialists who "know a lot" as creative researchers, capable of continuous innovative knowledge and self-production of new economic knowledge.

The education system, being the main (along with the entrepreneurial) sector, which forms intellectual capital in quantitative and qualitative aspect, is adequate to the needs of the existing development model. Statistical indicators of factor support of national economic systems development dynamics make it possible to conclude that the GDP growth rate is determined by the level of intellectual capital and innovations development. Therefore, the further economic development of Ukraine is determined by the innovative development of the education system and its strategic adaptation to the challenges of the external environment.

Let us evaluate the educational sector of knowledge generation. Nowadays, the status of the national higher education institution and the quality of specialists' training do not match the market demands, that leads to the need for additional training and retraining of higher education institutions graduates at the expense of enterprises. The main problems are such as: the lack of a modern material and technical base in educational institutions; inadequate level of interaction between business and educational institutions and low level of practical foundations in the context of technology learning; the lack of practitioners both in the educational process and in the management of the educational institution; the mismatch of education quality to market needs.

One of the main reasons for the significant deterioration in the quality of education in Ukraine is the lack of financial security. It is enshrined in the law that the state should provide at least 7% of GDP for education at the expense of state, local budgets and other sources of funding, not prohibited by law. At the same time, expenditure on education as a percentage of GDP decreased from 6.3% of GDP in 2018 and 6.2% in 2019 down to 5.6% of GDP in 2020 (Table II).

Table II: Dynamics of consolidated budget expenditures for education in 2015–2019 (general and special funds)

UAH million					
Expenditure	2015	2016	2017	2018	2019
GDP	1 988 544,0	2 383 182,0	2 982 900,0	3 332 300,0	3 946 900,0
Education expenditures -	114193,5	129437,7	177915,8	210032,3	228779,8

consolidated budget					
% to GDP	5,7	5,4	6,0	6,3	6,2
Education expenses -National budget	30185,7	34826,5	41297,3	44324,3	53257,4
Education expenses -local budgets	84007,8	94611,2	136618,5	165708	175522,4
Share of local expenditures education budgets relevant costs consolidated budget (%)	73,6	73,1	76,8	78,9	76,7

Source: Calculated according to[22].

If we compare the state budget spending on education due to GDP in Ukraine, which averages 6%, with the corresponding indicator in foreign countries, it seems that there is a rather high level of financing of the education sector. In particular, education expenditure as a percentage of GDP is in Norway – 7.5%, Sweden – 7.5%, Finland – 7.2%, Germany – 4.8%, United Kingdom – 5.5%, Canada – 5.3%, Spain – 4.2%. [23].

The activation of educational processes in higher education should be carried out in the light of global trends, characterized by: increased competition between universities for leadership in the global market for educational services; the growth of international scientific cooperation; adapting the educational process to the demand and needs of individuals, which is reflected in the mass character and continuity of higher education; diversification of government funding for education and research; increased coordination in the interaction between the labor market and higher education; continuous introduction of the latest educational technologies to improve the quality of educational services and more.

It should be noted that one of the fundamentally important and constructive point in strategy for enhancing the intellectual potential of society is the idea of pre-emptive education. While getting formed on the basis of the latest general scientific and humanitarian knowledge combination, such education should form in people qualities, among which experts distinguish "intellectual" components: systemic scientific thinking; creative activity; tolerance; high morality; informational culture. These are qualities of people, which should ensure survival and further sustainable development not only for the society, but for civilization. A model of advanced education, implemented by the organization of joint functioning of educational institutions, research institutions, production units, as a sources of supply of professionally trained personnel, which are capable of producing and implementing new ideas and projects, having at their disposal a modern methodology, a developed experimental base, banks and innovative knowledge base. For example, one trillion dollars in US GDP is the contribution of high-tech products from companies created by alumni of MIT and Stanford. The contribution of highly qualified employees to the US economy is 30 – 50 times higher than the revenue from licensed technology.

E. Stagnation of science as a negative intellectual potential use factor

The one should agree with the statement that science is the core of the intellectual potential of the society. As a consequence, we give a General evaluation of Ukrainian science today: chronic R & D underfunding over the last 20 years; significant decrease in the number of researchers; degradation of applied sciences sector, that was largely destroyed in the 1990s, the decline in the performance of public research centers; the insufficient inflow of the talented youth into science; the extremely low (with rare exceptions) scientific activity of the national universities; still quite powerful, though badly weakened and aging potential of science in the national academies; the devaluation of scientific knowledge authority in society. No reasonable prospects for the development of a professional career in Ukraine, as well as the low level of prestige of the scientists along with the low level of payment for their work gave rise to the most competitive scientists migration abroad trend, where they build a system of "upward mobility". According to various estimates, in 1990 more than 1 million researchers emigrated. Thus, losses of the real economy sector from the loss of a person with higher education, according to the UN experts, are estimated from 300 to 800 thousand dollars. The process of scientists outflow intensifies the emergence of new forms such as "leakage of ideas", without their generator physically moving, that is the person. In this process not scientists themselves emigrate, but their ideas, research results, so they belong to foreign customers. The corresponding outflow of scientists and people with higher education abroad is influenced upon the intellectual development of society, which is estimated by the total weight of researchers in the labour force.

The crisis situation in the scientific and technical sphere is mainly caused by its chronic underfunding. It should be noted that for all the independence of Ukraine's years, national science was funded on a residual basis and was not considered as one of the state priorities. At the same time, the sphere of science from the State Budget of Ukraine from 2017 to 2019 was directed accordingly: 0.22, 0.24 and 0.24% of GDP (even under Ukrainian legislation, this figure is at least 1.7%).

As a result of such volumes of financial support, the function of science in Ukrainian society usually plays a cognitive and socio-cultural function, because it is known from world practice that the possibility of science influence upon the level of economic development arises if it is financed over 0.9% of GDP. We believe that this is the basis for the decline of scientists and researchers prestige, and generally reduces the importance of scientific knowledge for the national economy and society. The well-known strategies aimed at building a knowledge-based economy include the European Union's Lisbon Strategy, which provides for science funding of at least 3% of GDP.

Thus, the economy of Ukraine is focused on the production of traditional industrial products with low gross value added, which is sold in saturated, unpromising markets for further development. Mainly, the development and research of scientific institutions are directed towards meeting the needs of the commodity economy. Under these conditions, according to the President of the Academy of Sciences of Ukraine, NASU academician B. Paton, "underfunding of the Academy will inevitably curtail research in many priority areas, significantly reduce the number of academic staff, and introduce incomplete employment" [24]. In Ukraine, there is nominally a system of innovative development institutes, but their activities do not meet the requirements of modernity, the transition to an innovative economy is extremely slow. The main problem is the lack of vision of high-tech development at the state level and, as a consequence, ineffective state policy in this area. At the same time, continuing attempts to "cure" the economy with outdated, dogmatic techniques and methods are certainly doomed to failure. People who seek to overcome the crisis and develop innovations by the old methods are "... dogmatists who seek the quadrature of the circle, because in trying to explain eternity through laws and relationships, they seek coincidences of incomparable magnitudes" [25].

So, countries whose development and science are lagging behind are experiencing growth limitation and are experiencing greater strain, including the outflow of the intellectual elite, the loss of the opportunity to use so-called technological rents.

One of the factors holding back the innovative development of the national economy in general and the subjects of economic activity in particular is that the number of highly qualified scientists has declined significantly in Ukraine in recent years (Table III).

Table III: Scientific staff and number of organizations

Year	The number of organizations that perform scientific research and development	Number scientists, persons	Doctors of Economics number Ukraine, persons	Number of PhD in Economics Ukraine, persons
2005	1510	105512	12014	68291
2006	1452	100245	12488	71893
2007	1404	96820	12845	74191
2008	1378	94138	13423	77763
2009	1340	92403	13866	81169
2010	1303	89564	14418	84000
2011	1255	84969	14895	84979
2012	1208	82032	15592	88057
2013	1143	77853	16450	90113
2014	999	69404	16090	86230
2015*	978	63864

Source: formed and calculated by the author based on [20].

*since the 2015 report, state statistical observations on the Doctors of Economics and PhDs number in Ukrainian economy have been abolished.

The number of research and development organizations has been declining over the entire study period and, accordingly, the number of researchers has been declining over the period 2005 – 2015. However, the Doctors of Economics and PhDs number in the Ukrainian economy has steadily increased over the period under review. Thus, the Doctors of Economics number increased by 34% in 2014, compared to 2005, and the number of PhDs have increased by 27% at the same period. This demonstrates the interest of scientists with advanced degrees to work in scientific institutions. However, there is no close link between science and the real economy, especially with small and medium-sized businesses. Compared to developed countries of the world enterprises, 40-50% less industrial enterprises were innovatively active in Ukraine. Even lower is the innovation activity among small and medium-sized enterprises. The diffusion of the innovation process in this sector is far behind the diffusion of the innovation process in the economy as a whole.

Since science is at the forefront of the structure of intellectual potential, its activation depends more on positive developments in the scientific field. The main scientific sphere activation directions in Ukraine should be: unification of academic, university, branch science and creation on this basis a single scientific space for the purpose of carrying out researches on priority directions, in accordance with national economic interests; formation of a new organizational and functional structure of science; increase of annual expenditures on science from the state budget; development of multi-channel sources of R&D funding; recessing the integration of science and education; developing methodological approaches to evaluate the results of scientific activity, which would fully take into account the achievements of the individual scientist, and the status of the scientific institution (organization, university) in which he works; introduction of a new procedure for certification of scientific personnel; adoption of the state program of raising the prestige of scientific and intellectual work, innovative culture of society; predicting the volume of intellectual migration in order to properly adjust socio-economic policies.

F. The effectiveness of intellectual and innovative activity in Ukraine

This section of the study was performed with the involvement of analytical report data of science and technology development, the result of scientific and technical activities during 2016-2018 [26].

The effectiveness of scientific and scientific-technical activities inevitably decreases as the intellectual potential of society decreases. In the practice of international comparisons, the results of scientific and technical activities are evaluated by patent activity and by fundamental bibliometric research indicators.

The number of patents for inventions, utility models and industrial designs reflect the effectiveness of scientific and technological activities (Table IV).

Table IV: The dynamics of submitted applications and received security documents based on the results of scientific (scientific and technical) works, units

Indicator	Total			Including at the expense of the general fund		
	2016	2017	2018	2016	2017	2018
The number of applications for the issuance of security documents, including:	8784	8514	8686	7144	6841	7240
in Ukraine	8769	8499	8672	7133	6830	7229
abroad	15	15	14	11	11	11
The number of security documents received, including:	8160	8421	8780	6480	6735	7013
in Ukraine	8144	8402	8760	6469	6721	7000
abroad	16	19	20	11	14	13

Source: Calculated according to [26].

In 2018, the number of applications for the issuance of security documents based on the results of scientific (scientific and technical) work performed at the expense of the General Fund, increased by 5.8% compared to 2017, accounting for 83.4% of the total number of applications for issuance security documents. At the same time, the share of security documents received in 2018 by institutions of higher education and scientific institutions of the Ministry of Education and Science was 66.3% (2017 – 65.8%).

The productivity of patent activity in Ukraine, apart from the growth rate of the number, is insignificant in comparison with the developed countries. Along with the patents decline of the society intellectual potential,

the reason for the low efficiency of patent activity is also the fact that patenting abroad is often quite burdensome for Ukrainian individuals and legal entities, due to the considerable limited financial resources and, in part, due to the peculiarities of their legal status. At the same time, let's recognize that OECD countries control 87% of the world's total registered patents. These indicators, in our opinion, indicate the absolute dominance of the knowledge-based economy.

In the context of globalization, scientific publications have an integrating function – they contribute to the active entry of national science into the world scientific community. The results of basic research reflect absolute and relative citation rates. The world's most recognized scientometric databases are Web of Science (WOS) of Clarivate Analytics and Scopus of Elsevier Publishing House. As of 2018 (2008-2018), the WOS publications ranked first place among 153 countries and took in the United States 26%. The top five also include China, the United Kingdom, Germany and Japan. Switzerland ranks the 16th in the single quotation results. Ukraine ranks the 46th. At the same time, the number of Ukrainian publications in the WOS databases in 2018 increased by 1.8 times compared to 2008. The similar trend in the publication activity for the period 2008 – 2018 is also observed according to the results of the Scopus database analysis. During this period, the number of publications increased 1.4 times. Leadership in the number of publications in scientific journals during 2008 – 2018 belongs to the United States. Ukraine ranks the 46th among 233 countries. The number of Ukrainian publications increased almost twice during the specified period. Analyzing the citation rate of Ukrainian publications (across all areas of research) as a percentage (according to Scopus database analytically processed by SCImago Journal & Country Rank) shows a tendency to significantly reduce the cited Ukrainian scientists works, especially in 2018, when the share of such publications is only 17.7% (2017 – 45.8%; 2016 – 56.1%).

The low level of values of Ukrainian explorers scientific activity bibliometric indexes is also explained by the fact that only about one hundred domestic scientific journals out of more than 1800 units total number of scientific professional editions are included in the list of editions «Science Citation Index – SCI», on the basis of which the number of articles is often determined. The inclusion of new journals in this list depends on the number of references to them in the editions of the list, with the vast majority of the references included being English-written.

The existence of significant gaps in the effectiveness of scientific and technical activities in Ukraine and developed countries adversely affects the effectiveness of international scientific and technical cooperation. Reducing the power of intellectual interaction between countries hinders scientific and technological progress.

The EU Innovation Scoreboard, which includes data on European Union countries, EU candidate countries and some other countries, has placed Ukraine in the Innovative Emerging Group with Bulgaria, Macedonia and Romania. Component analysis shows that Ukraine has significant unfulfilled opportunities in innovative development, especially in the commercialization of innovations and in the field of protection of intellectual property rights. The main advantages of Ukraine are the favorable geographical position, a large market, the presence of a deep and comprehensive free trade area between Ukraine and the EU and a relatively high level of intellectual potential development.

According to international experts, the dominant factor for Ukraine's success in the medium term will be the ability to generate knowledge and to implement the latest technologies in production as efficiently as it is possible. The main line of the strategy is to develop effective mechanisms for creating, disseminating and implementing knowledge in production processes. The selected key performance indicators characterize the level of the economy innovation and the potential of high technology development in Ukraine. The expected results are presented in the Table V.

Table V: Valuable (control) indexes and indicators for the development of high-tech industries in Ukraine

Indexes	2015 p.	2020 p. forecast	2025 p. forecast
Science-intensivity GDP, %	0,77	1,5	2,5
The share of products of high-tech industries in GDP, %	6	11	14
The share of high-tech products and services in goods and	5,5	9,0	15,0

services export, %			
Average depreciation of fixed assets in the real sector, %	75	60,0	50,0
Foreign direct investment in high-tech industries, billion USD	–	6,5	9
Number of STEM graduates, ths.	100	120	150

Source: compiled by authors based on [27].

V. CONCLUSION

The future of Ukraine is the intellect and innovation. Let us outline the specific measures of the political leadership and business elite of Ukraine in order to activate the intellectual potential of Ukraine in the conditions of knowledge-based economy formation:

- Ministry of Innovative Development creation, whose work will be fundamentally different from Soviet-style structures and ministries in Ukraine. The most intelligent people of the country, who know exactly how innovations develop, how information technologies work, should come to the new ministry;
- the reproduction of a powerful national innovation system in Ukraine as the basis of institutional support for the knowledge economy, which is able not only to respond to the challenges, but also to advance the development of the world system, to become its catalyst. The National innovation system of Ukraine must close the institutional and organizational gaps between the fundamental, applied, branch, educational and factory sectors of the economy; focus on strategic areas of innovation development; develop research in priority sectors of the economy, bridge the gap between science and production;
- the intellectual potential of the nation development by ensuring the competitiveness of education, the modernization of cultural policy, and the promotion of human social and public activity; stimulating the use of research and projecting results for innovative economic development [28].
- financial and organizational support for high-tech branches, diversification of research and production areas in line with the priorities of modern technology development; increased funding for research; state co-financing of R&D undertaken on behalf of business by the research sector in priority areas; development of public-private partnerships for joint research and development;
- the formation of an effective legal framework in the field of intellectual property (legislative regulation of issues related to the intellectual property rights protection whose legal relationship is not regulated or insufficiently regulated by special legislation; accession to international treaties in the field of intellectual property);
- the creation and promotion of the "cult of education and knowledge", improving the quality of educational services, their compliance with the needs of the labor market; increasing funding for the education system;
- the working-out and implementation of state programs for development of student innovative business (student business incubators and laboratories); the support for research and education programs by private corporations;
- the working-out of advanced training of managers in innovative spheres perspective programs, training of "knowledge management" and its implementation in enterprises, support of "spirit of mutual assistance";
- a new outlook of Ukrainian society formation, the development of corporate culture at all levels of government, the promotion of tolerance as the basis of a new society, the driving force of which is a highly intellectual human creator.

Thus, determining priorities in the fields of science, education, culture and spirituality, awareness of their impact on the processes of accumulation of national intellectual potential and the formation of value orientations in society, will undoubtedly contribute to the further integration of Ukraine into the European space.

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REFERENCES

1. B. Godin. Knowledge-Based Economy: Conceptual Framework or Buzzword? Project on the History and Sociology of S&T Statistics. Working Paper, no. 24, 2003.
2. F. Machlup. The Production and Distribution of Knowledge in the United States. Princeton, 1962.
3. D. Bell. Notes on Post-Industrial Society. The Public Interest, no. 7, 1967.
4. P. Drucker. The Age of Discontinuity. New York : Harper and Row, 1969.
5. A. Toffler. Future Shock. New York : Random House, 1970.
6. A. Serenko & N. Bontis. Meta-Review of Knowledge Management and Intellectual Capital Literature: Citation Impact and Research Productivity Rankings. John Wiley & Sons, Ltd., vol. 11, no. 3, 2004, pp. 185-198.
7. Th. M. Jorde, J. G. Sidak & D. J. Teece. Innovation, Investment, and Unbundling. September, 1999.
8. B. Geyets, Nature of transients to the knowledge economy. Economy of Ukraine, no. 4, 2004, pp. 4-14.
9. A. Kolot. The innovative work and intellectual capital in the system of the knowledge economy factors. Economics, no. 2, 2007, pp. 3-12.
10. Y. Bazhal. Knowledge economy – the economy of competitiveness. Informational Society. The way of Ukraine. Kiev : Library of Informational Society, 2004, pp. 219-224.
11. L. Fedulova. The concept of the knowledge economy in the world scientific theory and practice. Bulletin of Khmelnytskyi University, no. 43 (72), 2005, pp. 23-34.
12. A. Chukhno, P. Leonenko, & P. Yukhimenko. The institutional-information economy: textbook / Ed. Acad. NAS of Ukraine A. Chukhno. Kiev : Knowledge, 2010.
13. D. Amidon. Global Momentum Of Knowledge Strategy. I3 UPDATE Special Edition, February. [online access 2.02.2020] Retrieved from <https://www.skyrme.com/updates/se0299.htm>.
14. J. Schumpeter. The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle. New Brunswick (U.S.A) and London (U.K.). Transaction Publishers, 2008.
15. E. Carayannis & D. Campbell. Open Innovation Diplomacy and a 21st Century Fractal Research, Education and Innovation (FREIE) Ecosystem: Building on the Quadruple and Quintuple Helix Innovation Concepts and the "Mode 3" Knowledge Production System. Journal of the Knowledge Economy. 2. (September), no. 3, 2011, pp. 327-372.
16. T. Stewart. Brainpower? Fortune, June. 3, 1991, pp. 42-60.
17. L. Shevchenko. Universities as subjects of intellectual entrepreneurship. Theory and practice of jurisprudence. no. 1(5). 2014. [online access 19.08.2019]. Retrieved from <http://dspace.nlu.edu.ua/bitstream/123456789/6343/1/shevchenko.pdf>.
18. N. Bryukhovetskaya & I. Buleyev. Resources and Mechanisms for Investment and Innovation Development of Ukrainian Industrial Enterprises. Bulletin of Economic Sciences of Ukraine, no. 1, 2019, pp. 11-25.
19. The Global Innovation Index 2019. Effective Innovation Policies for Development. [online access 20.01.2020]. Retrieved from www.globalinnovationindex.org.
20. State Statistics Service of Ukraine (n.d.). [online access 9.01.2020]. Retrieved from <http://www.ukrstat.gov.ua/>.
21. Total health expenditure as % of GDP. World Health Organization. [online access 10.01.2020]. Retrieved from https://gateway.euro.who.int/en/indicators/hfa_566-6711-total-health-expenditure-as-of-gdp/visualizations/#id=19661&tab=table.
22. The Law of Ukraine 06.02.2020 "On the State Budget of Ukraine for 2020". [online access 12.02.2020]. Retrieved from <http://zakon.rada.gov.ua/laws/show/294-IX>.
23. Expenditure on education as % of GDP (from government sources). [online access 3.02.2020]. Retrieved from <http://data.uis.unesco.org/?queryid=181#>.
24. B. Paton. Underfunding of NAS of Ukraine will lead to curtailment of research projects and loss of scientific staff. Voice of Ukraine, no. 11 (6265), 2016.
25. A. Schopenhauer. Introduction to Philosophy; New paralyptomes; About interesting: Collection. Minsk : LLC "Potpourri", 2000.
26. Analytical reference "State of development of science and technology, results of scientific and technical activities for 2018", Kiev, 2019.

27. Strategy for the high-tech industries development by 2025. Department of Innovation and Intellectual Property Development [online access 3.02.2020]. Retrieved from www.me.gov.ua/Documents/Detail?lang=uk-UA&id=c9b6f0b0-1ed5-4aba-a25e-f824405ccc64&.
28. Humanitarian Development of Ukraine Concept, 2020. [online access 15.09.2019]. Retrieved from nauch.com.ua/kultura/10408/index.html. Kozhemiakina, S., Cherkasov, A., Reznik, N., Zhuravka, O., Mazunrov, S. (2018) New workplace forecasting in the industrial sector of the Ukrainian economy. *Problems and Perspectives in Management*, 16 (4), p. 384 – 394. Available at:
29. Reznik, N., Gupta, S., Sakovska, O., Ostapchuk, A., Levkina, R. (2019) Ukrainian world exchange market of oilseeds: A research of challenges for growth. *International Journal of Engineering and Advanced Technology*, 8(6), p. 3823 – 3829. Available at: <https://www2.scopus.com/authid/detail.uri?authorId=57202444035>
30. Reznik N., Ostapchuk A., Alekseieva K., Cherkasov A., Fedun I. (2019) Development of Public-Private Partnerships in the Agrarian Sector of Ukraine: Digitalization as a Priority. *International Journal of Recent Technology and Engineering*, 8 (3). Available at: <https://www.ijrte.org/wp-content/uploads/papers/v8i3c/C10461183C19.pdf> (accessed 07 January, 2020).
31. A.D Ostapchuk. Y.Yu. Demyan Ya.I. Tokar, S.K Gupta (2019) Mechanism of investment maintenance for the sustainable development of the agricultural sphere. *International Journal of Engineering and Advanced Technology*, 8(11). Available at: [IFERPh](https://www.scopus.com/record/display.uri?eid=2-s2.0-85073495954&origin=resultslist&sort=plf-f&src=s&sid=0892874e8038d9ade17a9f8e53686362&sot=autdocs&sdt=autdocs&sl=18&s=AU-ID%2857202444035%29&relpos=1&citeCnt=0&searchTerm=)<https://www.scopus.com/record/display.uri?eid=2-s2.0-85073495954&origin=resultslist&sort=plf-f&src=s&sid=0892874e8038d9ade17a9f8e53686362&sot=autdocs&sdt=autdocs&sl=18&s=AU-ID%2857202444035%29&relpos=1&citeCnt=0&searchTerm=>
32. N. Reznik, O Yushkevych, SK Gupta, L Zaburanna, AD Ostapchuk (2019). Peculiarities of trading strategies: its implementation and offers for improvement of effectiveness <https://www.semanticscholar.org/paper/Peculiarities-of-Trading-Strategies-%3A-Its-and-for-Yushkevych-Gupta/5172b04c54fed9602f20fea9618549056cd3e53a>