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KNOWLEDGE ECONOMY IN UKRAINE: CURRENT CONDITION AND PROBLEMS OF ITS DEVELOPMENT

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ЕКОНОМІКА ЗНАНЬ В УКРАЇНІ: СУЧАСНИЙ СТАН ТА ПРОБЛЕМИ ЇЇ РОЗВИТКУ

In modern global economy postindustrial industries have become main drivers of development and achieving an international competitiveness. As a result, scientists have developed a concept of a knowledge economy based on the accumulation, analysis and use of knowledge and the development of human capital to ensure sustainable economic development as a consequence. Ukraine possesses highly skilled human capital and considerable innovation potential, which is confirmed by the high efficiency of Ukrainian innovations in comparison to the resources used. These conditions create a favorable base for the development of a knowledge economy. In view of this, the purpose of this article is to evaluate its current condition in Ukraine by using a factor analysis of the Knowledge Economy Index in 2011-2019 to identify problems that impede its development and to develop appropriate recommendations. The study found that the most developed component of the knowledge economy in Ukraine is the skills to create innovation, that is, human capital. A more profound examination of the Index by the elimination method has shown that the development of the knowledge economy in Ukraine was maintained by increase in the use of information and communication technologies, namely the growth of the e-commerce sector, the development of services provided in electronic form, etc. At the same time, the main problems are the decrease in the openness of the economy, namely the decrease in the volume of foreign direct investment, the increase of political instability, the low level of use of innovations absorbed by firms and the conduct of research. In addition, an important problem for Ukraine is the brain drain of highly skilled human capital and, as a consequence, the decrease in the number of researchers in the population structure. Based on the results of the analysis, recommendations were made for macro- and micro-levels, as well as the feasibility of using high-performance work practices for human capital management. In particular, in a macro environment, it is recommended to use these methods in the educational system of Ukraine.

У сучасній глобальній економіці постіндустріальні галузі стали головними факторами розвитку держав та здобуття міжнародної конкурентоспроможності на світовій арені. У результаті науковці розробили концепцію економіки знань, яка базується на накопиченні, аналізуванні та використанні знань, та розвитку людського капіталу для забезпечення сталого економічного розвитку як їх наслідку. Україна володіє висококваліфікованим людським капіталом та значним інноваційним потенціалом, який підтверджується високою ефективністю українських інновацій порівняно з затраченими ресурсами. Наведені умови створюють сприятливу базу для розвитку економіки знань. Зважаючи на це метою цієї статті є оцінювання її поточного стану в Україні за допомогою факторного аналізу Індексу економіки знань за період 2011-2019 рр. для виявлення проблем, які перешкоджають її розвитку та розроблення відповідних рекомендацій. У ході дослідження було виявлено, що найбільш розвинутою складовою економіки знань в Україні є навички для створення інновацій, тобто, людський капітал. Більш ґрунтовне дослідження Індексу методом елімінування продемонструвало, що розвиток економіки знань в Україні відбувся завдяки зростанню використання інформаційно-комунікаційних технологій, а саме зростання сектору електронної торгівлі, розвиток послуг, які надаються в електронному вигляді тощо. Водночас основними проблемами є зниження відкритості економіки, а саме зменшення обсягу прямих іноземних інвестицій, зростання політичної нестабільності, низький рівень використання фірмами нововведень та проведення досліджень. Крім цього важливою проблемою для України залишається трудова еміграція висококваліфікованого людського капіталу і, як наслідок, зменшення чисельності дослідників у структурі населення. За результатами проведеного аналізу було надано рекомендації для макро- та макрорівня, а також обґрунтовано доцільність використання високоефективних методів роботи для управління людським капіталом. Зокрема у макросередовищі рекомендується використовувати дані методи в освітній системі України.

Keywords: *knowledge economy; competitiveness; high performance work practices; human capital; innovation potential.*

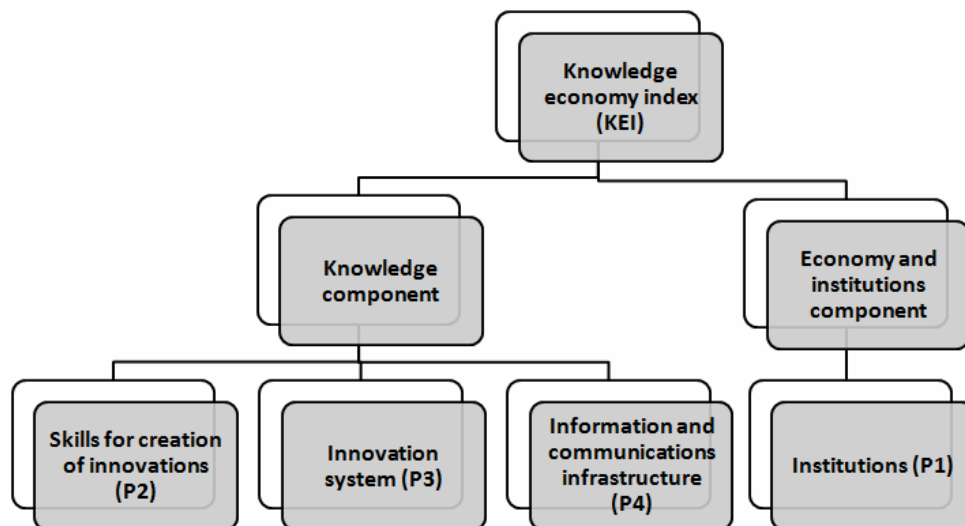
Ключові слова: *економіка знань; конкурентоспроможність високоефективні методи роботи; людський капітал; інноваційний потенціал.*

Problem statement. As a result of globalization processes, in most of economies of developed and developing countries a share of postindustrial industries, which are based on provision of services and usage of information, has increased. Consequently, the new concept of economic development – knowledge economy, was elaborated. Nevertheless, in spite of innovation potential and growth of IT-industry in Ukraine knowledge economy is low developed and is not considered as a basis for future sustainable development. Additionally, knowledge economy of Ukraine is not investigated profoundly, what could be a basis for making strategic decisions for economic development.

Analysis of recent research and publications. First evidence of positive impact of development of information and communication technologies on economic growth was supported by Erik Brynjolfsson and Lorin Hitt as a result of research of “productivity paradox” [1]. “Productivity paradox” lies in declining productivity as a result of usage of ICT. Nowadays a few approaches to understanding of knowledge economy exist. In earlier research some scientists found that a basis of knowledge economy is information, particularly information technologies, management of quality and communications [2]. Other studies consider as main component of knowledge economy production of goods and services, which are based on knowledge-intensive activities, what stimulates scientific and technological development [3]. From the prospect of importance of human capital in knowledge economy as its main driver high quality higher education is maintained, what allows countries to create tight relations between education and business, especially in development of venture projects [4]. Usage of modern technologies by firms and involvement of the most professional and creative specialists also put an emphasis on essential role of human capital [5]. On the modern stage scientists consider as a basis of knowledge economy strategies of development and involvement of labour force into national economies [6], and enhancement of its variety by elaboration of different migration and inclusive policies [7]. At local level knowledge economy is considered as systems of exchange of knowledge among cities in order to raise their agglomeration [8]. Nevertheless, the most pervasive and unified definition of knowledge economy belongs to the World Bank’s researchers, according to which knowledge economy is economy, where knowledge are acquired, created, diffused and used effectively for economic growth [9]. European Bank for Reconstruction and Development defines knowledge economy as economy, which is based on increasing productivity due to free access to information and stimulation of innovations, finally – intellectual capital development [10].

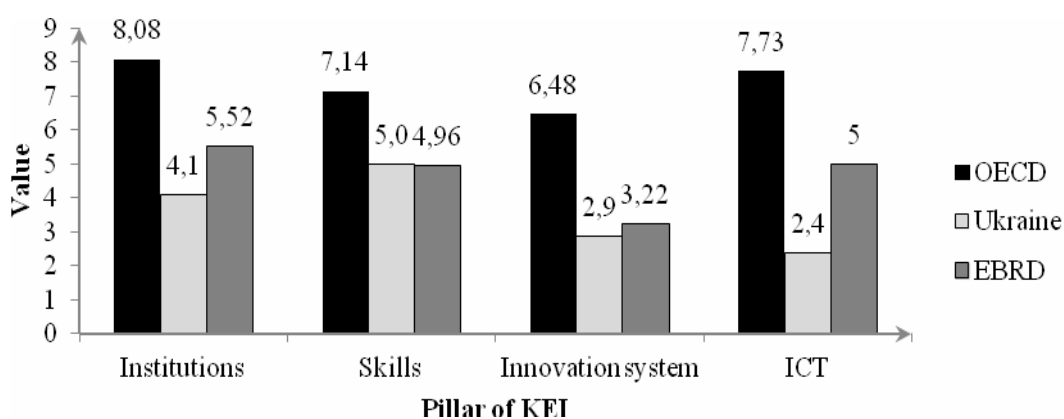
Research objective. The purpose of research is to evaluate current condition of Ukrainian knowledge economy, find out main problems of its development. As the result of the evaluation we are going to elaborate recommendations for national micro- and macroenvironments regarding knowledge economy.

Presentation of research. For evaluation of the current condition of knowledge economy in Ukraine and determination of key problems of its development was suggested to investigate Knowledge Economy Index, which is calculated by European Bank of Reconstruction and Development (EBRD) for countries-borrowers of this organization and countries of Organization of Economic Cooperation and Development (OECD). Calculation of Index is based on assessment of four knowledge economy pillars, particularly institutions, skills for creation of innovations, innovation system and information and communication infrastructure (pic.1).



Pic. 1. Pillars of Knowledge Economy Index [10]

Investigated countries are divided into countries with early, intermediate and advanced knowledge economies. In 2019 Knowledge Economy Index of Ukraine was 4,29 out of 10 possible score (26th place out of 38) and was related to early knowledge economy group of countries, which also include Bosnia and Herzegovina, Egypt, Kyrgyz Republic, Kosovo, Turkmenistan, Lebanon, Morocco, Tunis, Uzbekistan and Tajikistan. In 2011 Ukraine reached 27th place out of 38 countries with value of Index equal to 3,6. The most superior pillar of Ukraine is skills for creation of innovations, value of which is higher than average of countries-borrowers of EBRD (pic.2).



Pic. 2. Values of pillars of knowledge economy at the beginning of 2019 (based on [10])

For assessment of institutions openness of economy (D_1), business conditions (D_2), government (D_3) are evaluated; for assessment of skills for creation of innovations: general (D_4) and specialized skills (D_5) are evaluated; for assessment of innovation system: innovation inputs (D_6), outputs (D_7) and links between them (D_8) are evaluated; for assessment of information and communications infrastructure: ICT availability (D_9) and ICT sophistication (D_{10}) are evaluated. It is worth to mention, that Knowledge Economy Index is calculated as simple average mean of all dimensions (1).

$$KEI = \frac{\sum_{i=1}^4 P_i}{4}, \quad (1)$$

де KEI – knowledge economy index;

P₁ – i-pillar of knowledge economy index [9].

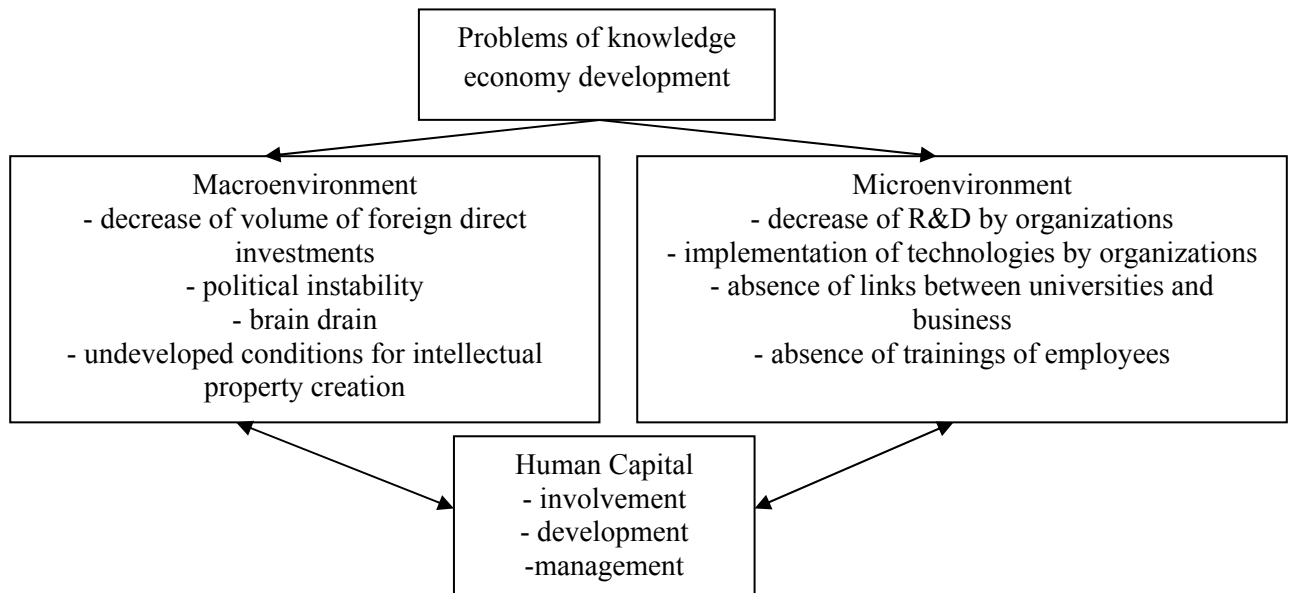
In order to determine which dimension had the greatest impact on development of knowledge economy in Ukraine was suggested to use factorial analysis by elimination method, which is concerned with gradual substitution of basic value of each factor by value of factor in current period, and calculation of change, which appears under impact of change in value of each factor (pic.3).

		KEI	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Change
	KEI	3,58	5,45	2,06	4,76	5,65	4,30	3,31	1,99	3,31	1,82	2,93	-
Institutions	D1	3,44	4,33	2,06	4,76	5,65	4,30	3,31	1,99	3,31	1,82	2,93	-0,13
	D2	3,62	4,33	3,81	4,76	5,65	4,30	3,31	1,99	3,31	1,82	2,93	0,17
	D3	3,48	4,33	3,81	3,33	5,65	4,30	3,31	1,99	3,31	1,82	2,93	-0,14
Skills	D4	3,48	4,33	3,81	3,33	5,72	4,30	3,31	1,99	3,31	1,82	2,93	0,01
	D5	3,57	4,33	3,81	3,33	5,72	5,15	3,31	1,99	3,31	1,82	2,93	0,09
Innovation system	D6	3,55	4,33	3,81	3,33	5,72	5,15	3,08	1,99	3,31	1,82	2,93	-0,02
	D7	3,55	4,33	3,81	3,33	5,72	5,15	3,08	2,03	3,31	1,82	2,93	0,00
	D8	3,56	4,33	3,81	3,33	5,72	5,15	3,08	2,03	3,42	1,82	2,93	0,01
ICT	D9	3,75	4,33	3,81	3,33	5,72	5,15	3,08	2,03	3,42	3,69	2,93	0,19
	D10	4,00	4,33	3,81	3,33	5,72	5,15	3,08	2,03	3,42	3,69	5,43	0,25
Sum												0,42	

Pic. 3. Factorial analysis of Knowledge Economy Index in Ukraine in 2011-2019 (own research)

The greatest positive impact had development of ICT availability and sophistication (+0,44 to general change of Index value), particularly development of electronic commerce and services, quality of the Internet and its availability in public places. But negative impact is caused by decline of openness of Ukrainian economy (-0,13), quality of governance (-0,14) and slight decrease of quality of innovation resources (-0,02). More profound analysis showed that decrease of openness of Ukrainian economy is related to decrease of amount of foreign direct investments inflows (-65,64%) [11], what is caused by discrepancies in law regulation of investment and innovation activity of firms, venture investments and absence of government support of both fundamental and applied research. Decrease of governance quality is related to political instability. Slight decline of innovation resources quality is explained by decrease in research and development expenses share in GDP of Ukraine (-39,2%) [11] and share of firms, which maintain research and development activities. Also, absence of impact of innovation results on improvement of knowledge economy, engendered because of brain drain of researchers (-21%) [11], decrease of number of patent applications by non-residents (-28,53%) [11]. Except these factors, links between education and business and technology absorption by firms are very significance for development of innovation system of Ukraine.

Accordingly to obtained results of analysis is possible to classify problems by the level of their solution: the level of state or the level of subjects of microenvironment, including firms and non-governmental organizations (pic. 4). It is worth to mention that formation and development of human capital is going in both macro- and microenvironment, as country creates by educational system and by provision of social services; firms creates human capital during its management in their activity.



Pic. 4. Problems of knowledge economy in Ukraine (own research)

The great advantages of current condition of knowledge economy of Ukraine are well-developed information and communication technologies, what significantly will facilitate its development. An incentive for foreign direct investments at macroenvironment should be improved investing climate of Ukraine. The first step could be improvement of legislative regulation of investing and innovation activities. Especially, in sphere of regulation of intellectual property,

A significant advantage of current state of knowledge economy in Ukraine is high level of development of ICT, what will greatly facilitate its evolvement. As an incentive for increase in volume of foreign direct investments at macroeconomic level in order to improve investment climate in Ukraine. A one of fundamental step should be an improvement in the sphere of investing and innovative activity. Especially an important problem is contradictory moments related to determination of intellectual property and its protection in Ukrainian law; lack of modern approaches for evaluation and recognition of innovation activity at enterprises, for instance recognition of innovational enterprise as an enterprise which produces more than 10% of innovative products; introduction into Ukrainian law of venture investments, which is essential in growing IT-industry and startups. Additionally, regulation of non-commercial organizations activity is still undeveloped. For prevention of brain drain, of researchers and scientists particularly, it is necessary to create better conditions for their development by provision of financial incentives and funding for research and publications in foreign journals. Except these tools, a great positive impact will have implementation of foreign experience and practices in conduction of scientific research and preparation of PhD thesis. For increase in patent applications by non-residents the procedure of patenting should be less complex; also integration of formal and qualified expertise would facilitate the process of patenting and would increase rate of intellectual property protection.

In microenvironment research and development and absorption of new technologies are dependent on investments. This problem could be solved to a great extent by establishment links between universities and business, what could decrease volume investments on formation of research basis and costs for personnel learning and training. Also enterprises' and organizations' demand for investments is rationally explained by demand for innovational goods and business-processes. Consequently, optimization of business-processes should be a main step in implementation of new technologies by organizations.

As human capital is the most developed component of knowledge economy in Ukraine is rational to elaborate its development in macro- and macroenvironment by usage of High-Performance Work Practices, or HPWPs. First of all, usages of HPWPs gives opportunity to not only accumulate human capital, but also to develop and use it for achieving of strategic goals. HPWPs by classic approach include three main directions of human resources management: recruiting of the most talented, involvement of employees into management of enterprise, usage of reward and commitment systems. Additionally, usage of HPWPs is optimal to implement into education system, enterprises and non-commercial organizations (pic.5).



Pic. 5. Main groups of HPWs practices (based on [12])

In educational system of Ukraine an important and necessary step is popularization and improvement of professional and technical education for formation of adequate and optimal labour market for future and more effective use of HPWPs. Additionally, an effective step would be an implementation of special trainings after school education to provide students with necessary professional experience and skills. Therefore, proper career guidance in schools should be undertaken for proper distribution of students among colleges and universities. It is advisable to monitor students' feedback on the quality of learning directly during their studies, and to involve students in initiating changes and improvements to the learning process. To properly motivate students, universities should review the process of providing scholarship, which will take into account students' academic performance and science work, and award scholarships only to the best students. In order to strengthen links between universities and business or other fields of activity, it is advisable to conduct joint internships for students, which will allow them to gain hands-on experience.

Usage of HPWPs in direction of recruiting of the most qualified employees by enterprises and organizations should take into account experience and skills of employees and their ability to learn. Also, training and re-training for employees has a positive impact on the formation of their loyalty to the organization. The essence of involving employees in the process of enterprise management lies in achieving a correspondence between the results of the enterprise and its strategy. Depending on the type of activity of the organization, the methods of attracting employees should familiarize them with the goals and plans of the organization, as well as implement teamwork to achieve them. An important problem for Ukrainian companies is the introduction of quality control systems. Human resource management at enterprise may also include restructuring of the task fulfillment process for improvement of efficiency, mentoring and monitoring.

Conclusions. Research revealed that human capital is the most developed component of knowledge economy in Ukraine. Additionally, well-developed ICT had positive influence on knowledge economy improvement in 2011-2019. Nevertheless, problems with openness of Ukrainian economy and innovation system are significant obstacles for elaboration of knowledge-based national economy. So, these problems occur in macro- and microenvironment, for which we have developed recommendations. In order to increase volume of foreign direct investments and support innovational activity government should improve law regulation of venture investment. To raise number of patents by non-residents is advisable to make application process more lucid by unification of formal and qualified expertise. To manage human capital in both micro- and macroenvironment we suggested touse high-performance work practices in directions of involvement, development and management of human resources.

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