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H. Mazur[1],
orcid.org/0000-0002-5061-1817,
V. Bolhov[2],
orcid.org/0000-0002-0631-302X,
I. Akhnovska[3],
orcid.org/0000-0001-9731-3801,
O. Dluhopolskyi[*4,5],
orcid.org/0000-0002-2040-8762,
S. Kozlovskyi[3],
orcid.org/0000-0003-0707-4996

1 – PHEE "Vinnytsia Academy of Continuing Education", Vinnytsia, Ukraine
2 – State University of Trade and Economics, Kyiv, Ukraine
3 – Vasyl' Stus Donetsk National University, Vinnytsia, Ukraine
4 – West Ukrainian National University, Ternopil, Ukraine
5 – WSEI University, Lublin, the Republic of Poland
* Corresponding author e-mail: dlugopolsky77@gmail.com

THE IMPACT OF EDUCATIONAL DEVELOPMENT ON THE COUNTRIES' COMPETITIVENESS IN THE KNOWLEDGE ECONOMY

Purpose. Development of recommendations for determining the impact of education on the formation of the competitiveness of national economies in the conditions of the knowledge economy using the analysis of existing indicators "measurement of the level of the knowledge economy", conducting an analytical study and developing, on this basis, an integral indicator of the impact of education on the competitiveness of the countries of the world.

Methodology. In the research process, the method of coefficient analysis and such methods as quantitative and graphic analysis, the method of data visualization, and the sociological survey method were used.

Findings. The work performed a ranking of countries using the developed indicator, which allows determining the competitiveness of countries in the world in the knowledge economy under the influence of the development of education. The basis of this rating is our own integrated rating coefficient, which is based on world indices, considering the degree of their importance in revealing the level of education and its influence on the process of formation of the knowledge economy. The work outlined directions for further research on the formation of an effective mechanism for the development of education based on the wide implementation of its open component.

Originality. It was revealed that there is no single indicator in global practice that would fully determine the competitiveness of the countries of the world in the conditions of the knowledge economy under the influence of education development. A survey was conducted, in which teachers, scientists, educators and public figures from Ukraine, Poland, Germany, Italy, Israel, Great Britain and Canada, a total of 203 people, took part. The results of the survey made it possible to propose our own integrated rating coefficient, based on a set of indicators from four world ratings.

Practical value. Research into the aspects of success in creating a knowledge economy by the leading countries, which are identified on the basis of the integrated rating coefficient, will allow us to spread their experience in creating effective educational prerequisites to other countries in the process of ensuring their own development.

Keywords: *open education, knowledge economy, development, educational services market, education system*

Introduction. The knowledge economy represents a stage in institutional economics where intellectual capital becomes a primary production factor, distinguishing it from the digital economy, which focuses more on technology and information infrastructure. The study aims to develop recommendations for evaluating the impact of education on national economic competitiveness within the knowledge economy by creating a comprehensive measurement indicator based on existing knowledge economy metrics and analytical research. This study explores the role of education in developing the knowledge economy, proposing that open education – characterized by accessibility, adaptability, and continuity – is crucial for equipping individuals with the necessary skills and knowledge. The study introduces an integrated rating coefficient to assess the impact of education on a country's competitiveness in a knowledge economy, highlighting Switzerland as the leader in educational development and knowledge economy practices. Identifying leading countries using the proposed indicator helps highlight future research areas for developing effective education systems. Such systems must be tailored to the unique historical and cultural characteristics of each country and aligned with the society's development priorities. Research into the functioning of the modern education system, the search for ways to improve it, and the modeling of the further development of the educational services market are increasingly attracting the attention of scientists worldwide from various fields of study. The growing interest in the education system from scholars and policymakers is explained by the increasing importance of this social institution under competitive relations and uncertainty in the *21st* century. The search for the optimal form of organization of the educational services market and the implementation of the most effective tools for realizing educational processes must be based on the principles of competitiveness and meet the needs of the times.

Today, leading countries in global economic progress are making significant efforts to implement the principles of forming a new system of socio-economic relations, known as the "knowledge economy". The main economic resource of this system is knowledge and competencies. Education serves as a tool for accumulating and disseminating knowledge in society. Thus, adapting the education system as the primary mechanism for accumulating, generating, and transferring knowledge to meet the demands of the modern knowledge economy should ensure the potential for sustained economic development in any economic system.

Literature review. When discussing the knowledge economy, the primary focus is on its transformative impact on various sectors of the national economy, promoting innovation, increasing productivity, and enhancing global [1]. The knowledge economy has also been viewed as a model that minimizes dependence on material assets and labor-intensive industries by focusing on knowledge creation, innovation, and managed information [2]. The eminent educational scholar G. L. Gutek focused on the development of the philosophy of education under the influence of social ideologies [3]. He believed that the development of information and communication technologies leads to the dehumanization of the educational process

in the context of traditional education. On the other hand, the informatization of society promotes the spread of open education. The concept of "open education" in the work by M. A. Peters & R. G. Britez is not limited to open educational resources. Still, it is integral to a new form of open society [4].

The knowledge economy can be understood in multiple ways. It is both abstract and tangible, representing a concept and a process that is shaped by and shapes societal practices. It encompasses both imagined and physical elements, and is both economic and political, theorized in academia and experienced in practice. As a scholarly concept, it has been discussed under various terms, including knowledge-based economy, intangible economy, knowledge capitalism, learning economy, cognitive capitalism, new economy, information economy, and creative economy. Despite these various definitions, the term "knowledge economy" is typically used to describe the socio-spatial organization of late capitalism since the 1980s, emphasizing knowledge and creativity in economic production over physical resources and manual labor [5].

In [6], the author proposed that the revolution in ICT enabled companies to leverage scientific and technical knowledge in ways that gave them an unprecedented competitive advantage, such as through continually decreasing transaction and processing costs. Consequently, this new knowledge economy was expected to lead to innovative organizational structures both within and among companies, along with a profound transformation in employment relationships, as a growing number of knowledge workers transitioned to becoming portfolio workers, freelancers, or self-employed.

The knowledge economy, characterized by innovation and the use of specialized knowledge, remains limited to a small segment of businesses and workers, contributing to global economic stagnation and inequality. Although traditional mass production no longer drives economic growth, creating a more inclusive and widespread knowledge economy remains an elusive goal, even for the wealthiest nations [7, 8].

Based on [9, 10] the "five C's for building team accountability" outlines a framework for fostering accountability within teams by focusing on five key areas: 1) common purpose: leaders must clearly communicate the value of knowledge sharing and learning within the organization, ensuring these concepts are integrated into everyday work processes; 2) clear expectations: teams should understand the expectations regarding their roles in knowledge management, with a focus on empowerment and accountability to drive the organization forward; 3) communicate & align: regular, open communication is vital for aligning team members with organizational goals, fostering innovation, and building trust within a diverse workforce; 4) collaborate and coach: organizations should develop and support knowledge management champions who can coach others, promote collaboration, and help build a culture of continuous learning; 5) consequences: leaders need to apply appropriate consequences, both positive and corrective, to reinforce accountability and motivate team members, ensuring learning and adaptation continue effectively.

The dominant view of the knowledge economy, based on P. Romer's early work [11], includes three key aspects. First, it asserts that the knowledge economy differs from previous forms of production because it is centered on ideas, which are "nonrivalrous" – meaning they can be used by many without being depleted. This nonrivalrous nature enables increasing returns to scale, which is essential for continued productivity and growth. Second, P. Romer emphasizes the role of profit-driven entrepreneurs and imperfect competition. While ideas may be widely accessible, intellectual property laws can limit their use, making them "excludable" in certain cases [12]. This creates opportunities for private incentives and entrepreneurship while also allowing for policies that balance private and social benefits. Third, P. Romer presents his theory in a way that fits within traditional economic growth models. By substituting knowledge for physical capital in growth equations, he incorporates idea-based production into the existing framework, allowing for the inclusion of new concepts without changing established economic methods [11, 12]. This approach introduces new ideas without altering the core methodology of economic theory.

In today's globalized world, knowledge has emerged as a critical factor for market success. For an economy to remain competitive, it must focus on the creation, transfer, and preservation of knowledge, as this is essential for maintaining a sustainable position in a competitive landscape. The main idea of the article [13] is that emphasizing knowledge-based economy factors enhances a country's competitiveness and contributes to its sustainability.

Some scholars focus on researching the psychological, pedagogical, and organizational foundations of the automation of management processes in education. For example, the concept of open education is often associated with the use of information and pedagogical technologies in distance learning, which are based on cloud technologies [14, 15].

In [16], the authors analyze the effect of an increase in knowledge-intensive activities on spatial inequality in US cities. Local shocks to innovation induce a clustering of knowledge-intensive jobs and residents, amplified by the response of rents and amenities. Another author [17] argues, that the knowledge economy is characterized by a strong emphasis on intellectual capabilities, with a focus on skills, expertise, and knowledge as key assets, particularly in sectors like IT, biotechnology, and education. Innovation and the use of new technologies are crucial for maintaining competitiveness and efficiency, while advanced information technology infrastructure supports effective communication and information processing.

The article [18] examines how the shift towards a knowledge economy has influenced the distribution of low-income work across Swedish regions over the past 30 years. It introduces a model with three mechanisms – polarization, upgrading, and labor market tightening – through which the knowledge economy impacts low-income work. Findings show that the prevalence of low-income work in Sweden has decreased, and regional differences have lessened over time. While the knowledge economy can lead to increased polarization and an expansion of low-income work, the positive effects of upgrading skills and tightening the labor market outweigh these negatives. The study highlights the importance of institutional factors, especially labor market institutions, in shaping these outcomes and compares the results with studies from other contexts.

In the 1990s, the knowledge economy was seen as a key to future prosperity, emphasizing the importance of cultivating workers' knowledge over traditional capital investments. As O'Donovan argues, this perspective suggests that reforming the organization of the education system and policy proposals can achieve both long-term economic development and inclusion. [19]. However, this optimistic view has been replaced by concerns over automation, artificial intelligence, and changes in the digital economy and globalization.

In our view, the provided definitions are accurate and well-founded. However, it would be appropriate to note that certain limitations are inherent to the research field. When discussing the knowledge economy, it is important to consider the societal domain that underpins its development, namely education, and how the educational system should be organized in the new society shaped by the knowledge economy.

Research objective, methodology and data. The study aims to develop recommendations for assessing the impact of the state of development of the national education system on the level of competitiveness of national economies in the context of the knowledge economy. This will be achieved by analyzing existing indicators of measuring the level of development of the knowledge economy, conducting analytical research and developing an integrated rating indicator based on this analysis to measure the impact of education on the competitiveness of the national economy.

Results and discussion. The knowledge economy, first of all, should be understood as the modern institutional system of organizing the national economy, which is based on the use of intelligence as the main factors of production. The knowledge economy (knowledge-intensive industry, knowledge society, knowledge-based economy) in its essence and characteristics is not identical to the digital economy (information economy, digital economy, digital society, information society). The main elements of the knowledge economy are: 1) the rejection of the economy of depletion and exploitation of nature; 2) knowledge acts as the main economic resource; 3) maximum dissemination of information and free access to knowledge; 4) in the economic structure, the service sector prevails over other industries, and vertically integrated structures are transformed into network organizations. Thus, the knowledge economy implies the maximum liberalization of socio-economic relations.

Based on the hypothesis that: 1) education is one of the determining factors in the formation of the knowledge economy and the provision of competitive advantages in the context of the new world order; 2) the modern education system requires radical reform to accelerate transformation processes, the important question is: "What should education be like in the context of the knowledge economy?".

In our opinion, the most optimal form of education organization in the context of the knowledge economy is open education. This is not some new hierarchical form of organization of the national education system in the classical sense; on the contrary, it is the idea of spreading knowledge based on the liberalization of relations in the field of educational services, minimizing formalism in the organization of the educational process, where technical means and information capabilities are not the goal, but tools for spreading knowledge and ensuring the quality of educational services. Thus, open education is a modern form of enlightenment.

Figure illustrates that open education at the current stage of development of understanding of this process is formed based on the interaction of three interrelated defining principles. These principles complement and influence the formation of each other:

1. Accessibility. This principle encompasses all interpretations of the term, including the openness of educational resources to anyone wishing to gain knowledge, the absence of age, social, gender, geographical, financial, religious, or any other restrictions, and the possibility to participate in the educational process at any time of the day, regardless of the student's location.

2. Adaptability. This principle is based on the dynamism of the structure of initial programs for acquiring specific professions or skills depending on market needs and technological changes in the field of knowledge application. This approach considers the possibility of combining subjects or courses in the process of obtaining a profession, depending on the needs of the individual receiving educational services.

3. Continuity. This principle is founded on the notion that the rapid pace of scientific and technological progress in the modern economy forces professionals to continuously improve their skills and acquire new knowledge to maintain competitiveness. This principle stems from the "lifelong learning" approach. Educational institutions must adapt to this principle and provide opportunities for graduates to improve their skills after completing their education and obtaining a profession. Such cooperation can continue throughout an individual's professional life. The ability of an educational institution to ensure such interaction with its students will determine its competitiveness in the educational services market.

An industry where future trends in the process of acquiring professional education can be demonstrated is the IT sector. On the one hand, this field requires deep knowledge and skills in specific areas of application, while on the other hand, the importance of higher education among workers in this sector is decreasing.

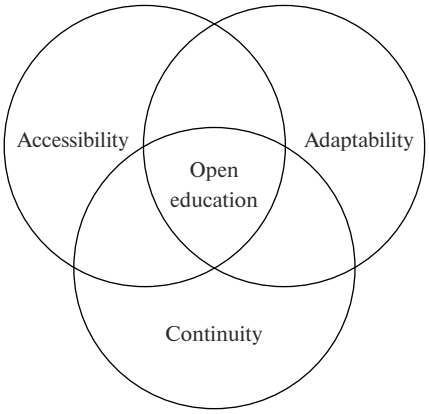

Fig. Principles of forming Open Education

Since 2008, the Stack Overflow website [20] has been conducting independent surveys of IT professionals worldwide. According to the results of this survey, 70 % of all respondents have higher education; however, this figure varies significantly by region: in the USA – 60 %, in Ukraine – 75 %, and in India – 15 %. Moreover, the most common level of education among those with higher education is a bachelor's degree – 60 % of all respondents. A very interesting fact is that the number of people acquiring new knowledge from various online resources is constantly increasing, reaching 70 % in 2023, which is 10 % more than in 2022.

The continuity of learning, as one of the features of open education, is quite vividly manifested in the IT [20]: 78 % of Stack Overflow respondents indicated that their employer allows them to improve their qualifications through open education, and they take advantage of this opportunity.

Another vivid example of the modern implementation of the principles of open education, but at the pre-university level, is the world's first virtual school, created based on the existing educational institution "Yushi Kokusai" in Japan and named "Nijigen Gakuen" [21]. The founder and developer of the educational programs in this institution is the educational corporation "Seeisha Gakuin". The educational process is built exclusively on the use of the metaverse, which is why its name translates to "School of the Virtual World". Each student has free access to VR headsets, a personal anime avatar in the metaverse, the VR platform "Planet", and the distributed microblogging service SNS Misskey [21]. The curriculum also includes individual recommendations: from repeating lessons in middle school to preparing for entrance exams to the University of Tokyo. Any child from any corner of the world can study at this school. Upon graduation, all students receive official diplomas certifying their education.

As can be seen from the given examples, open education, like the knowledge economy, uses technology only as a means to unlock the creative potential of individuals, rather than as an end goal.

The understanding of the inevitability of transitioning to a knowledge economy is demonstrated by leading scientists from various fields, representatives of expert communities, and political organizations [16, 17]. Therefore, to identify the most powerful resources and measure the readiness of national economies for transformation, global organizations such as the World Bank, United Nations Development Programme (UNDP), European Bank for Reconstruction and Development (EBRD), and the Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF) are continuously working on developing the most relevant measurement indices.

In 2012, the Global Knowledge Index (GKI) was developed in collaboration with the United Nations Development Programme (UNDP) and the Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF) as a replacement for the well-known Knowledge Economy Index (KEI). The

first GKI calculations were presented in 2017 for 131 countries worldwide [22].

According to some experts [24], the GKI is the most comprehensive indicator, taking into account seven components, known as sub-indices: pre-university education; technical and vocational education; higher education; research, development, and innovation; information and communication technologies; economy; and enabling environment. The last sub-index "enabling environment" appeared in the calculations starting in 2020 and was given a weight of 10 %, while the other components were each weighted at 15 %.

Therefore, analyzing the data from this index starting from 2019 will be particularly representative (Table 1). Analyzing the data presented in Table 1, we can note the negative impact of the COVID-19 pandemic on the GKI index indicators of each country, as well as on the average global indicator. Only starting from 2023 has there been a trend towards the recovery of these index indicators. Nevertheless, despite the overall negative picture of 2021 and 2022, some countries have steadily improved their position in the overall ranking. Such countries include Israel, which improved its position from *21st* place in 2020 to *14th* place in 2023; Estonia, which improved from *25th* place in 2020 to *11th* place in 2023; Malta, which jumped from *28th* place in 2020 to *18th* place in 2023; and Belgium, which showed development from *17th* to *13th* place over the same period.

The indicators of another ranking, the Global Talent Competitiveness Index (GTCI), have been calculated for several years by INSEAD in partnership with the Descartes Future Institute and the Human Capital Leadership Institute. The essence of this ranking lies in calculating a consolidated indicator that assesses the ability of countries to develop based on stimulating innovation and utilizing talent, which is a decisive factor in economic growth in the knowledge economy. The overall ranking of a country is calculated by deriving a weighted average indicator, determined by six main components, which, in turn, consist of 69 indicators. The first four components determine the country's efforts to create talent and form the so-called "Input" sub-index. The other two sub-indices are the so-called "Output" [23].

The determination of the "Input" GTCI sub-indices is based on the effectiveness of the "Attract – Grow – Retain" chains, which are used by leading companies worldwide for talent management. Multinational enterprises define their approaches to talent management as the organization's efforts to attract, select, develop, and retain talented employees to meet the strategic needs and plans of the company. The calculation of the "Output" sub-indices is based on the effectiveness of VT and GK Skills, determined by the employment level of graduates with technical or vocational education. This indicates the alignment of the skills obtained by technical and vocational workers with market demands. GK Skills indicate the level of development of creative and intellectual skills among specialists and managerial personnel. This indicator is based on the level of innovation and development in key sectors of the national economy.

Primarily, this index analyzes the level of educational development and the implementation of the "lifelong learning" approach within the national economy, as well as the experience and access to personal development opportunities (Table 1).

The next indicator is the annual IMD World Talent Ranking (WTR), determined by the IMD World Competitiveness

Table 1

The place of leading countries in the overall GKI & GTCI rankings [22, 23]

Country	GKI score (rank)					GTCI score (rank)				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
Switzerland	73.0(1)	73.6(1)	71.5(1)	68.3(2)	69.1(1)	81.82(1)	81.26(1)	82.09(1)	78.20(1)	78.96(1)
Finland	69.0(2)	70.8(3)	69.9(4)	66.9(4)	68.1(2)	73.78(6)	74.47(7)	77.07(7)	73.28(8)	74.35(6)
Sweden	69.0(3)	70.6(4)	70.0(2)	67.0(3)	68.0(3)	73.53(7)	75.82(4)	77.98(5)	73.93(5)	73.86(9)
Netherlands	68.0(6)	69.7(5)	69.5(5)	66.3(5)	67.3(4)	73.02(8)	74.99(6)	77.31(6)	73.90(6)	74.76(5)
USA	68.0(4)	71.1(2)	70.0(3)	68.4(1)	66.9(5)	76.64(3)	79.09(2)	78.81(3)	73.93(4)	76.60(3)
Denmark	65.0(11)	68.3(8)	69.0(7)	66.0(7)	66.7(6)	73.85(5)	75.18(5)	77.98(4)	75.44(3)	76.54(4)
Luxembourg	68.0(5)	69.5(6)	67.3(12)	66.1(6)	66.0(7)	71.18(10)	73.94(8)	76.96(8)	71.58(11)	72.88(11)
UK	67.0(8)	68.1(9)	69.0(8)	63.9(9)	65.7(8)	71.44(9)	72.27(12)	74.84(12)	71.59(10)	73.75(10)
Austria	64.0(16)	65.4(16)	66.8(14)	63.6(10)	65.3(9)	68.31(18)	68.87(17)	72.10(18)	67.56(17)	69.05(17)
Norway	65.0(13)	66.1(13)	68.7(9)	64.2(8)	65.1(10)	74.67(4)	72.91(9)	75.84(9)	73.88(7)	73.96(7)
Estonia	61.0(24)	62.2(25)	66.7(15)	63.2(13)	64.2(11)	60.74(23)	61.97(24)	66.57(22)	62.47(20)	64.29(20)
Singapore	68.0(7)	69.2(7)	69.3(6)	63.3(12)	64.2(12)	77.27(2)	78.48(3)	79.38(2)	75.80(2)	77.11(2)
Belgium	65.0(12)	65.4(17)	65.5(16)	65.5(16)	64.1(13)	68.48(17)	68.87(18)	72.18(17)	67.67(16)	69.12(16)
Israel	62.0(20)	63.7(21)	64.6(18)	62.6(15)	63.9(14)	63.26(20)	65.66(20)	68.65(21)	59.83(23)	62.20(25)
Germany	64.0(14)	66.2(11)	66.9(13)	63.6(11)	63.7(15)	70.72(14)	72.34(11)	74.13(14)	68.15(14)	69.88(14)
Australia	62.0(23)	62.2(23)	64.2(20)	60.6(22)	63.1(16)	71.08(12)	72.53(10)	75.06(11)	71.93(9)	73.93(8)
Korea Rep.	62.0(18)	64.2(19)	63.8(21)	62.2(17)	62.9(17)	54.19(30)	59.59(27)	63.16(27)	59.10(27)	62.21(24)
Malta	60.0(26)	59.7(27)	61.9(26)	61.4(19)	62.7(18)	59.10(26)	62.02(23)	65.72(23)	60.64(22)	62.66(21)
Slovenia	60.0(27)	58.8(28)	63.7(22)	60.9(21)	62.5(19)	54.44(29)	57.42(31)	63.16(26)	58.27(28)	60.62(28)
Iceland	64.0(15)	65.2(18)	67.5(10)	62.9(14)	62.3(21)	71.03(13)	70.90(14)	75.21(10)	68.96(12)	69.38(15)
France	63.0(17)	64.0(20)	64.9(17)	61.5(18)	61.1(24)	61.82(21)	64.83(21)	69.18(19)	64.58(19)	66.91(19)
New Zealand	62.0(21)	63.2(22)	63.3(24)	63.0(23)	62.0(22)	71.12(11)	69.84(16)	73.86(15)	66.88(18)	67.26(18)
Canada	60.0(25)	61.1(24)	61.0(24)	59.0(24)	62.4(20)	70.43(15)	71.26(13)	74.77(13)	68.11(15)	70.13(13)
Ireland	66.0(10)	66.1(14)	64.5(19)	61.1(20)	61.6(23)	70.15(16)	70.45(15)	72.82(16)	68.36(13)	70.45(12)

Center since 2013. This ranking evaluates the competitiveness of talent from 64 countries worldwide [25].

This indicator assesses the quality of professionals in national economies based on three main comprehensive criteria: "Investment and Development", "Appeal", and "Readiness".

The first criterion, "Investment and Development", considers not only public and private investments in the education sector but also the quality and accessibility of educational and medical services, and the priority given by enterprises to the improvement of employee skills.

The second criterion, "Appeal", determines the attractiveness of national economies for talent and is based on indicators such as the cost and quality of life; the talent attraction and retention index; methods of employee motivation in companies; the number of talents leaving the country – referred to as "brain drain"; the fairness of the justice system; and the wages of professionals in the service sector, specifically teachers, healthcare workers, sales consultants, mid-level and senior managers, and environmental conditions.

The final criterion, "Readiness", assesses the context of talent reserves and the ability of the education system to meet the needs of national economies for qualified personnel. It considers many components that analyze the quality of skills and competencies of the workforce and skilled workers. These components include the level of managerial, financial, and linguistic skills; experience in international company management; the educational level of future talents – graduates in natural sciences, mathematics, ICT, and engineering; the level of student mobility; and the scores of 15-year-old students in the PISA program.

Analyzing the dynamics of the WTR indicators, significant progress can be observed in Belgium, Iceland, and Ireland. At the same time, negative trends are evident in countries such as Austria, Denmark, Norway, and Sweden (Table 2).

Another ranking indicator that continues to attract interest is the Human Development Index (HDI). This composite indicator measures the level of human potential in countries and is calculated annually based on the assessment of living standards, literacy, education, and longevity. The HDI was developed in 1990 by a group of economists led by Mahbub ul Haq, a former finance [33] minister of Pakistan and later an advisor to the head of the UNDP. The index has been published within the framework of the United Nations Development Programme (UNDP) in annual Human Development Reports since 1990.

The HDI is calculated based on three types of indicators [26]: 1) Life Expectancy Index (LEI) – assesses longevity; 2) Education Index (EI) – evaluates the literacy rate of the population (the average number of years spent in education) and the expected duration of schooling; 3) Income Index (II) – measures the standard of living, defined through Gross National Income (GNI) per capita at purchasing power parity (PPP) in US dollars.

Despite the different methodologies and approaches to calculating these indices, the same countries consistently appear leaders across all rankings. Notably, Switzerland stands out as an unequivocal leader in all rankings.

From the data presented in Tables 1–2, it can be observed that most indices showed a decline for the majority of countries in 2020, with some continuing to drop through 2022. This decline is attributed to the negative impact of the COVID-19

Table 2

The place of leading countries in the overall WTR & HDI rankings [25, 26]

Country	WTR score (rank)					HDI score				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
Switzerland	100.0(1)	100.0(1)	100.0(1)	100.0(1)	100.0(1)	0.957	0.960	0.957	0.965	0.967
Finland	83.14(8)	81.89(12)	83.13(8)	83.83(6)	80.55(6)	0.936	0.939	0.939	0.941	0.942
Sweden	86.94(3)	88.23(5)	90.61(2)	88.65(2)	79.93(10)	0.943	0.947	0.944	0.949	0.952
Netherlands	81.81(9)	82.86(10)	82.53(9)	81.38(9)	83.34(5)	0.939	0.941	0.938	0.941	0.946
USA	79.24(12)	79.76(15)	77.27(14)	75.70(16)	74.56(15)	0.930	0.933	0.923	0.921	0.927
Denmark	90.80(2)	91.78(2)	86.46(5)	84.91(5)	80.53(7)	0.942	0.946	0.946	0.947	0.952
Luxembourg	86.65(5)	89.19(3)	88.34(3)	83.33(7)	84.39(2)	0.921	0.925	0.921	0.927	0.927
UK	69.09(24)	70.75(23)	69.50(21)	63.19(28)	60.52(35)	0.928	0.933	0.920	0.931	0.940
Austria	86.91(4)	86.64(6)	85.36(6)	82.87(8)	79.93(9)	0.917	0.920	0.916	0.920	0.926
Norway	85.95(6)	86.44(7)	87.65(4)	85.08(4)	78.90(11)	0.960	0.961	0.963	0.964	0.966
Estonia	66.88(27)	73.93(19)	72.02(19)	72.71(17)	73.98(17)	0.890	0.893	0.891	0.890	0.899
Singapore	81.80(10)	83.47(9)	80.78(12)	77.43(12)	79.96(8)	0.942	0.945	0.942	0.942	0.949
Belgium	78.42(14)	79.35(16)	79.35(13)	76.81(13)	83.75(4)	0.933	0.936	0.930	0.938	0.942
Israel	73.26(19)	71.89(22)	69.03(22)	70.40(20)	71.05(19)	0.908	0.909	0.906	0.911	0.915
Germany	80.78(11)	82.23(11)	81.77(10)	80.76(10)	78.46(12)	0.946	0.961	0.948	0.948	0.950
Australia	76.41(16)	81.12(13)	70.58(20)	72.28(18)	73.12(18)	0.941	0.941	0.948	0.949	0.946
Korea Rep.	62.54(33)	64.49(31)	61.24(34)	57.69(38)	61.96(34)	0.918	0.922	0.922	0.926	0.929
Malta	...	...	...	...	...	0.903	0.905	0.901	0.912	0.915
Slovenia	64.16(31)	65.06(30)	66.13(27)	64.37(25)	63.82(26)	0.916	0.918	0.910	0.916	0.926
Iceland	85.15(7)	89.03(4)	84.24(7)	85.69(3)	84.33(3)	0.958	0.958	0.955	0.957	0.959
France	68.53(25)	66.15(28)	68.24(25)	66.95(23)	66.25(24)	0.903	0.905	0.900	0.906	0.910
New Zealand	75.57(17)	72.28(21)	72.56(18)	62.46(31)	62.57(31)	0.936	0.937	0.935	0.936	0.939
Canada	78.63(13)	84.38(8)	74.58(15)	77.92(11)	76.73(13)	0.930	0.932	0.928	0.934	0.935
Ireland	73.29(18)	75.03(18)	73.94(17)	76.07(15)	76.27(14)	0.938	0.942	0.945	0.946	0.950

Table 3

The values of the indicators' specific weight in the overall structure of the *IRC*

No	Indexes	Designations	Number of experts who prioritized each index	Values
1	Global Knowledge Index (GKI)	j_1	47	0.23
2	Global Talent Competitiveness Index (GTCI)	j_2	71	0.35
3	World Talent Ranking (WTR)	j_3	53	0.26
4	Human Development Index (HDI)	j_4	32	0.16

Table 4

Ranking of leading countries based on the results of the *IRC* calculation

Country	Index value					Ranking				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
Switzerland	54.79	71.52	71.33	69.23	69.53	1	1	1	1	1
Finland	47.59	63.79	64.82	62.98	62.63	5	8	7	4	4
Sweden	48.52	65.87	67.10	64.49	62.27	3	3	2	2	7
Netherlands	46.98	63.97	64.65	62.42	63.31	9	7	8	6	2
Denmark	49.61	66.04	65.79	63.81	63.07	2	2	3	3	3
Norway	45.95	63.35	65.29	62.90	61.37	10	9	5	5	9
Germany	45.91	62.08	62.74	59.63	59.51	11	10	11	11	11
Iceland	47.15	59.47	63.90	61.04	60.54	8	11	10	10	10
USA	47.58	64.92	63.92	61.44	61.58	7	6	9	8	8
Luxembourg	47.59	65.20	65.53	62.07	62.63	5	5	4	7	4
Singapore	48.46	65.24	64.88	61.39	62.54	4	4	6	9	6

pandemic on both open education development and the knowledge economy overall.

Therefore, considering the above, it can be asserted that there is no single indicator in global practice that comprehensively determines the competitiveness of countries in the context of a knowledge economy influenced by educational development. Consequently, we propose our own integrated rating coefficient, which is based on the aforementioned indices, taking into account their relative importance in revealing the level of education and its impact on the process of forming a knowledge economy.

The proposed integrated rating coefficient (*IRC*) is calculated using the following formula

$$IRC = \sum_{i=1}^{n} K_i \times j_i,$$

where is the value of the integrated rating coefficient for the development of open education; K_i is the value of the index determining the development of open education; j_i is the specific weight of the i_{th} index in the overall structure of the coefficient calculation; i is the index included in the overall analysis, $i = 1, \ldots, n$.

To determine the specific weight of the importance of each index, i.e., the degree of their importance in revealing the level of education and its impact on the formation of a knowledge economy, we conducted a survey. This survey included 203 participants comprising educators, researchers, teachers, and public figures from Ukraine, Poland, Germany, Italy, Israel, the United Kingdom, and Canada. The results of their survey are summarized in Table 3.

The calculation of our proposed integrated rating coefficient is presented in Table 4. An important condition of our experiment is the mandatory presence of the country among the leaders in all the indices involved.

Calculations according to our integrated rating coefficient for the period 2019–2023 are relevant. It is safe to say that the best prerequisites for the development of education and the knowledge economy in general are implemented in Switzerland. Sweden, the Netherlands, Denmark and Finland are also among the leading countries.

Conclusion. Further strengthening of competition on the world stage for human capital, on the one hand, will be caused by the processes of decentralization, digitalization, self-government and mechanisms of direct democracy, and on the other hand, by increasing the importance of knowledge, methods of its systematization, generation and distribution. Education in this system is gaining significant weight, and approaches to the organization of educational services today tend toward new, more informal approaches.

In general, the definition of the leading countries with the help of the developed authors' indicator makes it possible to outline the directions of further research on the formation of an effective mechanism for the development of education for the future. It should be noted that such a mechanism needs to be adapted to the historical and cultural features of one or another country and the priority directions of society's development.

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Вплив розвитку освіти на конкурентоспроможність країн в економіці знань

Г. Ф. Мазур[1], *В. Є. Болгов*[2], *І. О. Ахновська*[3], *О. В. Длугопольський*[*4,5], *С. В. Козловський*[3]

1 – Комунальний заклад вищої освіти «Вінницька академія безперервної освіти», м. Вінниця, Україна
2 – Державний торговельно-економічний університет, м. Київ, Україна
3 – Донецький національний університет імені Василя Стуса, м. Вінниця, Україна
4 – Західноукраїнський національний університет, м. Тернопіль, Україна
5 – Університет WSEI, м. Люблін, Республіка Польща
* Автор-кореспондент e-mail: dlugopolsky77@gmail.com

Мета. Розробка рекомендацій із визначення впливу освіти на формування конкурентоспроможності національних економік в умовах економіки знань за допомогою аналізу існуючих показників вимірювання рівня економіки знань, проведення аналітичного дослідження й розробки на цій основі інтегрального показника впливу освіти на конкурентоспроможність країн світу.

Методика. У процесі дослідження використовувався метод коефіцієнтного аналізу та такі методи, як кількісний і графічний аналіз, метод візуалізації даних, соціологічний метод опитування.

Результати. У роботі виконане рейтингування країн за допомогою розробленого показника, що дозволяє визначити конкурентоспроможність країн світу в умовах економіки знань під впливом розвитку освіти. Базою цього рейтингу є власний інтегрований рейтинговий коефіцієнт, що оснований на світових індексах з урахуванням ступеню їх важливості у розкритті рівня освіти та її впливу на процес формування економіки знань. У ході роботи окреслені напрями подальших досліджень щодо формування дієвого механізму розвитку освіти на базі широкого впровадження її відкритої складової.

Наукова новизна. Виявлено, що у світовій практиці відсутній єдиний показник, який би в повному обсязі визначав конкурентоспроможність країн світу в умовах економіки знань під впливом розвитку освіти. Проведене опитування, в якому взяли участь викладачі, науковці, педагоги та громадські діячі з України, Польщі, Німеччини, Італії, Ізраїлю, Великої Британії та Канади в загальній кількості 203 особи. Результати опитування дозволили запропонувати власний інтегрований рейтинговий коефіцієнт, що базується на сукупності показників чотирьох світових рейтингів.

Практична значимість. Вивчення аспектів успіху у створенні економіки знань країнами-лідерами, що виявлені на базі інтегрованого рейтингового коефіцієнту, дозволить поширити їх досвід у сфері створення дієвих освітніх передумов на інші країни у процесі забезпечення власного розвитку.

Ключові слова: *відкрита освіта, економіка знань, розвиток, ринок освітніх послуг, система освіти*

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