

## СОЦІАЛЬНА ЕКОНОМІКА І ПОЛІТИКА. МІЖДИСЦИПЛІНАРНІ ДОСЛІДЖЕННЯ В ЕКОНОМІЦІ

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### HIGHER EDUCATION AS A FACTOR BOOSTING COMPETITIVENESS OF THE NATIONAL ECONOMY

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**Abstract.** *The goal of the academic paper lies in confirming the hypothesis that higher education is not just one of various factors influencing the competitiveness of the national economy, but is an overarching factor that can completely change the development of the economy and significantly improve the country's position in the international rating of competitiveness, and, thus, prove the importance of higher education as the major driver in increasing competitiveness of the national economy. The relevance of the research topic is confirmed by current problems of society development, characterized by the trends in technological development, globalization, digitalization, and population ageing. The problems outlined enhance the importance of higher education in training a new generation of specialists and retraining the older generation, forasmuch as they are able to develop and maintain modern high-tech production and economic processes, which are the basis for economic development and increase competitiveness of the national economy. The present academic paper considers the major indicators of modern higher education development and determines that they are crucial in the development of competitiveness of the national economy, which fact is confirmed not just by the studies done by international organizations, but also by the statistical regression analysis method. The general scientific methods of cognition were used in the research, namely: analysis, synthesis, induction, and deduction. Statistical information was analyzed through the application of the methods of averages, comparisons, and determination of the largest and smallest values. The economic and mathematical methods of analysis were used in order to prove the importance of higher education in the development of competitiveness of the national economy. In particular, a correlation-regression analysis was conducted and the equation of the dependence of the national economy's competitiveness on two indicators was determined, namely: the level of skills and the level of information technology implementation. Along with this, in the course of the research, the Pearson coefficient which defines the relationship density*

*between higher education indicators was determined: the level of skills (Skills), the use of IT technologies (ICT adoption), and competitiveness of the national economy. The results of the research reveal close interconnections between the level of skills and the degree of using advanced technologies, and even more profound influence of these elements on the level of competitiveness of the national economy. Thus, the results of the research confirm the hypothesis that higher education is not just one of many factors influencing competitiveness of the national economy; but is a crucial factor that can completely change development of the economy and significantly improve the country's position in the international competitiveness rating. The conclusion has been made that development of education towards rapid growth of digital competencies and usage of advanced technologies will improve provision of modern production with high-quality labour resources. Consequently, as a result, it will positively affect the economic situation and competitiveness of the national economy.*

**Key words:** *higher education, competitiveness, national economy, skill level, level of IT technologies implementation, digitalization, labour force, higher educational institutions.*

**Problem Statement.** With each passing year, the society and economy are becoming more complex systems with numerous interconnections in the context of globalization. It's an obvious point that while developing the national economy in the direction of globalization, international cooperation and interaction, it is necessary to create products that are able to compete in international markets on price and non-price criteria. Currently, it is almost impossible to create competitive products for the international market without the use of advanced information technologies. Moreover, modern models of economic growth are able to operate at low levels of employment. As a result, this leads to rising unemployment and insecurity of the employed population, performing mechanical work, which every year is increasingly replaced by robotic lines and automated technologies. Under conditions of increasing robotization and automation of production processes, more and more people are left without work, and this is becoming a general development trend in almost all advanced countries. In the context outlined, only higher education makes it possible to form a sufficient base of necessary knowledge that will satisfy the market and economic needs of modern high-tech and intellectual industries. Along with this, it should be noted that higher education should meet the current demands of the society, which tend to rapid globalization and digitalization. Under such conditions, higher educational institutions should respond quickly enough to changes in the society and train professionals who can contribute to the automation of production processes, robotics and digitalization, which is the basis for the development of a modern competitive economy.

**Analysis of Recent Studies and Publications.** In recent years, economists have been quite actively exploring the issues of assessing the role and determining the impact of education at the national [10, 11] and at the global level [6, 7, 8, 9]. Herewith, such studies are carried out in the context of individual countries.

It should also be noted that the issues of the influence of higher education on the development of the economies of the world countries are quite debatable in scientific circles among scholars from different countries, both advanced and developing [14]. In particular, authors such as Bloom, D. E. [2] investigated the impact of higher education in low-income countries, as for instance, African countries. Savchenko, N. [11] studied the problem in the context of the development of higher educational institutions in Ukraine, that is, a medium-

income country. A lot of studies have been done in terms of advanced countries and the global situation, in general. Donnelli, K., Rizvi, S., Barber, M. [6] identify the crucial significance of higher education in developing a national economy. This research is currently especially relevant, at a time when the world is faced with the problems of a pandemic, as a result of which learning is transferred to a remote form. This significantly worsens the quality of acquired knowledge due to the unwillingness of higher educational institutions to provide quality educational services in digital format [3]. The studies specified confirm the unpreparedness of the majority of higher educational institutions for such challenges and the necessity to reform approaches to learning. At the same time, the general trends in the development of higher education as a factor boosting the competitiveness of national economies remain insufficiently studied.

**Problem Statement (formulation of the goals of the academic paper).** The purpose of the academic paper lies in confirming the hypothesis that higher education is not just in the chain of various factors influencing the competitiveness of the national economy, however, it is an overarching factor that can completely change the development of the economy and significantly improve the country's position in the international rating of competitiveness, and, thus, prove the importance of higher education as the major driver in increasing the competitiveness of the national economy. In order to conduct the economic and statistical research, statistical information from open resources was analyzed, in particular, the report of the World Economic Forum as of 2019 [12], according to which a sample of countries, forming the basis for statistical analysis and confirmation of the hypothesis, was carried out.

**Methodology.** For conducting the research, general scientific methods of cognition were used, namely: analysis, synthesis, induction and deduction. Statistical information was analyzed by methods of averages, comparison, determination of the largest and smallest values, etc. In order to prove the importance of higher education in the formation of the competitiveness of the national economy, economic and mathematical methods of analysis were used. In particular, a correlation-regression analysis was performed and the dependence equation of the competitiveness of the national economy on two indicators was determined: the level of skills and the level of information technology development. Along with this, in the course of the research, the Pearson coefficient has been determined, which identifies the density of the relationship between indicators of higher education and the competitiveness of the national economy.

**Presentation of the Basic Material.** The importance of higher education as a component of the national economy in the process of social and economic development is growing every year. Changes in public life, relating to the development of innovations, necessitate the training of a sufficient number of specialists who are able to master these technologies and apply them in various situations, introducing certain innovations in accordance with market trends and consumers' expectations [12].

In 2019, the Organization for Economic Cooperation and Development (OECD) conducted the investigation of educational development trends [13]. According to the results of the study, three crucial factors influencing the future of education have been identified, as follows: globalization, digitalization and aging of the population. Over the next ten years,

the majority of the world's population will consist of people with middle income. It should be mentioned that this trend is determined by such countries as China and India, which currently have active economic development through the involvement of new technologies. According to OECD forecasts, these countries will have a concentration of about 90% of people who will have enough income to afford higher education. This fact will significantly increase the pressure of governments on higher educational institutions, which should adapt the conditions for obtaining it in accordance with the expectations of the population. In turn, the population will expect from higher educational institutions such level of training, which will allow after its completion getting a high-paying job and meeting the needs of modern production and economic processes in various fields.

It is an obvious point that international mobility in the future will have a growing trend, which will lead to the necessity to integrate students from different groups of the society to uniform educational standards. At the same time, such standards should be applied not only to the population within a certain country, regardless of social status and wealth, but also to the population of other countries. It is quite probable that in case such international standards are not available and ensured in a particular country, there may be some social protests in the future against the existing system of higher education and social protection, in general. However, it should be noted that it is impossible to create a unified information space that will become available to students from different countries without the use of advanced technologies in higher education. However, the introduction of such technologies is a rather complicated process that not every country can cope with. This situation will be especially problematic for low-income countries; while in high-income countries and for the world's leading institutions of higher education, such systems will allow maintaining a leading position in the market of educational services and ensuring further economic growth and competitiveness of the national economy.

Nevertheless, currently it can be clearly stated that the development of higher education lags behind the development of digitalization of production processes. Consequently, it is necessary to go to great lengths in order to take advantage of the tools and strengths of new technologies, which are already being implemented in production processes, the study of which is not currently provided by educational programs due to the lack of qualified competent staff willing to work in higher educational institutions [6].

In the course the research, it has been revealed that with spreading of information technology new problems arise related to information confidentiality and information security. After all, it is precisely these challenges that are becoming very serious for higher educational institutions, forasmuch as such problems are difficult to solve even within the framework of professional information environments. It should be emphasized that higher educational institutions do not have a sufficient number of technical personnel, appropriate equipment and technologies for ensuring information security. As a result, the problems outlined can become a serious threat to development towards globalization.

The studies conducted by the OECD point to the fact that the population's life expectancy has increased by 10 years in the past 45 years. According to the investigations of the Organization for Economic Cooperation and Development, it has been found that the average

upper age limit of the population has increased from 70 to 80 years. The population over the age of 65 is expected to increase in the coming decades. For this reason, older workers may face employment challenges. It is quite probable that the expectations of the need for the possibility of further training and retraining of workers and the received digital literacy around the world are expected. At the same time, digital literacy and critical thinking will become more necessary for the older generation than for the young people. Moreover, it is necessary to develop special programs for the older generation for submitting new material, the methodology of which will differ significantly from the representation of material for students up to 24 years of age, accustomed to existing technologies and who are able much easier to absorb information.

Ongoing studies on the development of higher education are carried out not only within the Organization for Economic Cooperation and Development. For instance, the international platform Studyporals, uniting 7750 universities from around the world, determines that in addition to aging of the population, there will be other significant challenges that need to be prepared for, in particular:

1) there will be significant changes in the labour market, oriented towards personnel, who are able to perform production tasks in terms of automation of production processes;

2) workers will be involved in the implementation of economic processes not only from the countries in which the economic activity is carried out, but also employees from other countries who will have sufficient skills to service production processes;

3) the gap between the employer's expectations and the level of education offered by higher educational institutions will significantly increase. It is expected that the development rate of technology will be even higher than the development rate of higher education in the current environment, and, consequently, the number of qualified labor force will significantly decrease. At the same time, the remuneration level of qualified personnel will increase proportionally and the level of unskilled personnel will decrease due to the displacement of the need for it through the means of automation and robotics;

4) numerous advanced countries will implement strict migration policies, create additional barriers to the mobility of low- and middle-income countries;

5) the country's economic growth will depend on the markets of developing countries, forasmuch as they will become the raw material and labour appendage for the organization of production in advanced countries;

6) there will be an imbalance between demand in developing countries and supply in advanced countries;

7) higher education will face a reduction in public funding; it will develop in the direction of private organizations, which will directly set the task of providing production staff with a sufficient level of knowledge and skills.

The influence of the challenges outlined on the development of higher education will be as follows: 1) more people will be involved in higher education. In particular, it is projected that by 2030 the number of students will be 332 million, which is 56% more than in 2015; 2) lifelong learning will become more widespread, which will provide additional skills in order to perform certain jobs and master certain information technologies [5]; 3) online learning will

be popularized and disseminated; this will allow embracing a larger number of the population and making education accessible to everyone [4]; 4) there will be a division of educational programs, providing for narrow-profile educational processes that will train specialists not at the industry level, but for performing specific focused tasks [7]; 5) orientation towards results in a career will become a key direction in the development of higher educational institutions, which will receive a sufficient number of students only on the condition of ensuring employment and practical use of the knowledge gained and their compliance with production processes.

The mobility indicators of international students will also change significantly; in particular, their number is projected to reach 6, 9 million by 2030, which is 51% more than in 2015. The educational processes will be characterized by innovation and the expansion of transnational learning models, the spread of English-language programs in new directions, the growth of the ambitions of world-class universities and investments of public and private organizations in them [10].

Commercial organizations and various stakeholders, supporting higher education institutions, will force educational institutions to design and offer students more relevant, accessible and flexible academic programs, aimed at catching up with quantitative growth and qualitative shifts in the demand for quality labour resources.

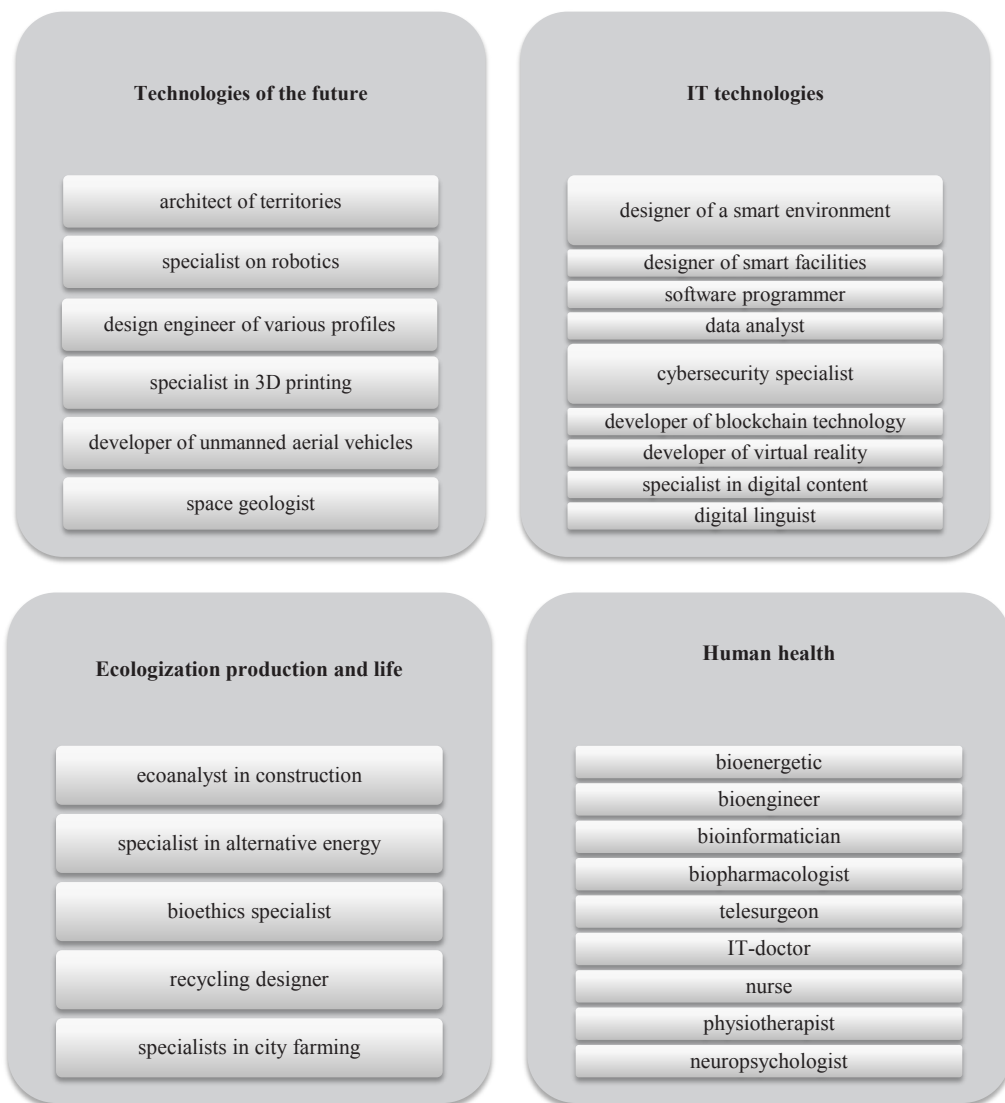
The trends presented by the international platform have an impact on higher education in numerous developing countries. Some of the above mentioned trends pose a real threat to existing outdated systems of higher education, forasmuch as most of them will face a mismatch of skills that the labour market demands, budgetary pressures and other challenges. As a result, the strict migration policies of high-income countries can be used to benefit the growth of foreign students; this, in turn, will reduce the influence of national higher educational institutions, which have lost their popularity and ratings without a sufficient number of students.

According to estimations of world experts published by Forbes, BBC, Trade Schools Colleges, and experts of the scientific-research group “Digital Transformation”, the top requested will be specialists who will be able to design, implement innovations in production processes, taking into account the challenges of the future. At the same time, advanced technologies are needed not only in technical areas, but also in social and humanitarian, including health protection [1]. The most popular professions of the future are represented in Figure 1.

At the same time, professions related to health, education, the provision of individual services, creativity, will remain relevant, forasmuch they cannot be replaced by either robotic technology or automation.

Therefore, the analysis of international research organizations’ reports has revealed that digital literacy is the basis for the formation of the country’s competitiveness, forasmuch as it depends on the ability of enterprises to attract qualified personnel to economic activity, which is the basis of economic and innovative development and, consequently, competitiveness.

This hypothesis can be confirmed by statistical methods. In particular, the World Economic Forum annually prepares a report on the level of competitiveness of various countries, consisting



**Fig. 1. The most popular professions of the future**

Source: [13]

of a number of indicators, the average value of which forms a rating to determine the indicator of competitiveness. Higher education and its quality have a significant impact on the development of competitiveness. For instance, the indicator “Skills” has been formed, consisting of four major and nine supplementary components of this indicator, in particular:

- the state of the current workforce;
- skills of the current workforce;

- projected state of the future workforce;
- skills of the future workforce [12].

The principal indicators determining the skill level of the current workforce are the average period of study, including both secondary and higher education. The major indicators determining the skills of the current workforce are as follows: the adequacy of staff training programs, the quality of training, digital skills among the active population, the difficulty of finding skilled workers in the market. These parameters are responsible for the overall level of higher education in the country.

Concerning the major indicators characterizing the future workforce, they rely more not on the level of higher education, but on the level of secondary education. The components of this indicator include the duration of schooling. The basic indicators characterizing the skills of the future workforce are the development of schoolchildren's critical thinking and the student-to-student ratio in primary schools.

Let's conduct a statistical study of dependency between competitiveness (Competitiveness), skill level (Skills) and the use of IT technologies (ICT adoption).

Table 1

**Statistics indicators of skill level, use of IT technology and general level of competitiveness for selected countries**

Country	Rank 1/141		
	Skills	ICT adoption	Competitiveness
Zimbabwe	110	112	127
Zambia	115	117	120
Yemen	134	139	140
Venezuela	68	94	133
Uruguay	60	14	54
United States	9	27	2
UK	11	31	9
UAE	39	2	25
Ukraine	44	76	85
Uganda	122	125	115
Turkey	78	69	61
Tajikistan	71	121	104
Switzerland	1	17	5
Sweden	7	4	8
Spain	37	19	23
Slovenia	26	40	35
Singapore	19	5	1
Saudi Arabia	25	36	36
Russia	54	22	43

Country	Rank 1/141		
	Skills	ICT adoption	Competitiveness
Romania	72	32	51
Portugal	43	34	34
Poland	34	51	37
Norway	6	10	17
Malaysia	30	33	27
Luxembourg	17	20	18
Kazakhstan	57	44	55
Japan	28	6	6
Italy	42	53	30
Israel	14	45	20
Ireland	21	49	24
India	107	120	68
Greece	41	52	59
Germany	5	36	7
France	35	28	15
Finland	2	13	11
Denmark	3	9	10
China	64	18	28
Canada	12	35	14
Austria	16	50	21

Source: sampling has been conducted according to data of [12].

Let's denote the level of competitiveness by  $Y_i$ , the level of skills  $X1_i$ , the level of use of IT-technologies by  $X2_i$ . Let's analyze the level of dependency between indicators  $X1$  and  $Y$ . Pearson coefficient is 0, 881 for this sample. If we compare the indicators  $X2$  and  $Y$ , the Pearson coefficient is even higher and is 0, 884. However, the dependency between the level



of education (skills) and the level of use of IT technologies is 0,816. The conclusion can be made that the level of education and the use of advanced technologies have approximately the same impact on competitiveness; at the same time, they have a fairly high density of communication, this makes it possible to create a model of competitiveness on the level of education and use of IT technologies.

The results of regression statistics are reflected in Table 2.

Table 2

**The results of regression statistics of skills dependence, use of IT technologies and the general level of competitiveness based on the sample of table 1**

Multiple R	0,926355522
R Square	0,858134553
Adjusted R Square	0,850859401
Standard Error	15,21277251
Observations	42

The density of links between these indicators is even higher, at the level of 0,926, confirming the fact that these indicators are complementary in developing the countries' competitiveness.

Let's determine the statistical coefficients that reveal the level of dependency and make it possible to show the mathematical interrelationship between the indicators.

Table 3

**Statistical coefficients of skill level dependency, use of IT technologies and general level of competitiveness based on the sample of table 1**

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-3,31	3,79	-0,87	0,39	-10,97	4,35	-10,97	4,35
X Variable 1	0,52	0,12	4,55	0,00	0,29	0,76	0,29	0,76
X Variable 2	0,52	0,11	4,77	0,00	0,30	0,74	0,30	0,74

Thus, the formula of dependency between indicators is as follows:

$$Y = 0.52X_1 + 0.52X_2 - 3.31$$

Where Y – level of competitiveness;

X<sub>1</sub> – skills level;

X<sub>2</sub> – level of implementation of IT technologies.

Therefore, the statistical method can confirm the expectations of international organizations concerning the development of higher education in the direction of digitalization and globalization of processes that will have a significant impact on economic development and countries' competitiveness.

**Conclusions and Prospects for Further Studies.** Nowadays, higher education is one of the crucial components of the national economy development of any country, regardless of

the current level of education, income level and economic and social system. Consequently, the principal objective of higher education lies in reducing the gap between the demands of the economic sector for qualified personnel and the supply of higher educational institutions. The problem exists in every country, and the country creates its own methods of solving it. The basic problems of higher education are related to the global processes of digitalization, globalization of social-economic processes and the general tendency of aging of the population. This creates new challenges for the development of higher education, which should not only focus on teaching young students, but also on training adult students in order to make them competitive in the labour market. Those countries that cope with the task best of all, as a result, obtain a competitive economy that is able to produce innovative, competitive products and create high standards of living and economic activity of the population. The research confirms the close interconnections between the development of education and the use of advanced technologies and the even more dense influence of these elements on the level of competitiveness. Therefore, it can be argued that the development of education in the direction of rapid growth of digital competencies and the use of advanced technologies will improve the provision of modern production with quality labour resources, and as a consequence, it will positively affect the economic condition and competitiveness of the national economy.

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## ВИЩА ОСВІТА ЯК ЧИННИК ПІДВИЩЕННЯ КОНКУРЕНТОСПРОМОЖНОСТІ НАЦІОНАЛЬНОЇ ЕКОНОМІКИ

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**Анотація.** Мета статті – підтвердити гіпотезу, що вища освіта не перебуває в ланцюзі чинників конкурентоспроможності національної економіки, а є головним чинником, який здатний повністю змінити розвиток економіки та суттєво покращити позицію країни у міжнародному рейтингу конкурентоспроможності, й у такий спосіб довести значущість вищої освіти як основного чинника підвищення конкурентоспроможності національної економіки. Актуальність теми дослідження підтверджується сучасними проблемами розвитку суспільства, що характеризуються тенденціями технологічного розвитку, глобалізації, цифровізації та старіння населення. Зазначені проблеми посилюють значущість вищої освіти в підготовці нового покоління спеціалістів і перепідготовки старшого покоління, що здатні розробляти та підтримувати сучасні високотехнологічні виробничо-господарські процеси, котрі є основою економічного розвитку та підвищення конкурентоспроможності національної економіки. Розглянуто основні показники розвитку сучасної вищої освіти та визначено, що вони є ключовими у формуванні конкурентоспроможності національної економіки, що підтверджено не лише дослідженнями міжнародних організацій, а й статистичним методом регресійного аналізу. У дослідженні використано загальнонаукові методи пізнання: аналіз, синтез, індукція та дедукція. Статистична інформація була проаналізована методами середніх величин, порівняння, а також визначення найбільшого та найменшого значення. З метою доведення значущості вищої освіти у формуванні конкурентоспроможності національної економіки використані економіко-математичні методи аналізу, зокрема проведено кореляційно-регресійний аналіз і визначено рівняння залежності конкурентоспроможності національної економіки від двох показників: рівня навичок та рівня впровадження інформаційних технологій. Також під час дослідження було визначено коефіцієнт Пірсона, що визначає щільність зв'язку між показниками вищої освіти: рівнем навичок (Skills), рівнем використанням ІТ-технологій (ICT adoption) та конкурентоспроможністю національної економіки. *Результати дослідження виявили щільні взаємні зв'язки між рівнем навичок та рівнем використання передових технологій і ще більш щільний вплив цих елементів на рівень конкурентоспроможності національної економіки. Отже, результати дослідження підтвердили гіпотезу про те, що вища освіта*

не просто перебуває в ланцюзі різних впливаючих чинників на конкурентоспроможність національної економіки, а є ключовим чинником, що здатний суттєво покращити позицію країни у міжнародному рейтингу конкурентоспроможності. *Сформульовано висновок*, що розвиток освіти в напрямі стрімкого зростання цифрових компетенцій та використання передових технологій допоможе покращити забезпеченість сучасного виробництва якісними трудовими ресурсами, і у підсумку позитивно вплине на економічний стан і конкурентоспроможність національної економіки.

**Ключові слова:** вища освіта, конкурентоспроможність, національна економіка, рівень навичок, рівень впровадження ІТ-технологій, цифровізація, робоча сила, заклади вищої освіти.

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