

UDC 37.014.542

<https://doi.org/10.33271/nvngu/2021-3/148>

A. Ye. Artyukhov,
orcid.org/0000-0003-1112-6891,
T. A. Vasylieva,
orcid.org/0000-0003-0635-7978,
S. V. Lyeonov,
orcid.org/0000-0001-5639-3008

Sumy State University, Sumy, Ukraine, e-mail: a.artyukhov@pohnp.sumdu.edu.ua

AN INTEGRATED METHOD FOR EVALUATING THE QUALITY OF EDUCATION AND UNIVERSITY PERFORMANCE

Purpose. To create an integrated methodology for assessing educational and scientific activities of higher education institutions (HEI) following the recommendations of international ranking agencies and specific indicators that consider the institution's position at the national level.

Methodology. The combined method of evaluation of the HEI activity is applied. Some evaluation indicators are inherent in the HEI (in whole or in part). Others have a specific numerical value. The calculation of the final ranking indicator is based on comparing universities according to the indicators from the methodology (ranking positions in the world educational and scientific space, education quality indicators, financial indicators, and quality of scientific activity) with the reference university, which has the best result for each indicator.

Findings. An integrated methodology algorithm for assessing the educational and scientific activities of the HEI is presented and recommendations are given for the use of each of the indicators depending on the peculiarities of the ranking (for example, general ranking or ranking by direction).

Originality. An integrated method of external evaluation of educational and scientific activities is proposed, considering both well-known indicators of world ranking agencies and specific (different from world ranking indicators) indicators for assessing universities' activities at the national level.

Practical value. The method allows determining some economic indicators of the dynamics (positive or negative) of university development and finding "bottlenecks" in the implementation of specific activities in the institution's educational and scientific activities. The methodology considers the actual educational activities (training of higher education institutions at all levels). It also allows us to assess the success of free economics in implementing scientific activities as a significant factor in creating new knowledge and improving educational services quality.

Keywords: *quality of education, technology transfer, economic development, evaluation methods, external evaluation*

Introduction. The primary basis for the successful launch of technology transfer is the existing system of quality assurance of educational and scientific activities at higher education institutions. It is essential to look at the whole system not from the inside but from the outside. The inside view can be idealistic, prejudiced and biased due to the reluctance to highlight actual and potential development threats. In this case, independent experts' opinion can be decisive for changing the vector and magnitude of the force applied in solving a problem. External evaluation of the HEI may have some difficulties due to only a qualitative assessment (for example, the presence/absence of an internal system for ensuring educational activities, grant funding, research laboratories, and so on). In this case, it becomes difficult to establish an actual ranking of HEIs and provide recommendations for improving its activities to ensure the quality of education and technology transfer. The assessment of the success of HEIs should be based on socio-economic indicators of activity – the ranking of graduates in the labor market and financial conditions for them (employment rate of graduates) should appear certain, research funding through public funding and self-raised funds, indicators the impact of research on the development of science, and others. In this case, creating a tool for external evaluation of the quality of

education, technology transfer, and economic performance indicators of the HEI is an urgent and timely task.

Literature review. The authors obtained the results of the study on the innovative potential of the state [1], challenges under the UN Sustainable Development Goals by 2030 in terms of quality education (goal 4) [2], financial aspects of the educational process at the national level [3]. To develop the above provisions, a particular method of a quantitative assessment of HEIs' success in ensuring the quality of educational and scientific activities should appear. Additionally, this evaluation methodology should consider the effectiveness of free economic activity of HEIs as business universities, as noted in [4]. It will provide an opportunity to assess the financial component of the implementation of the results of their research, as well as have an impact on the formation of quality content of educational programs. Opinions about the importance of the quality assurance system of educational and scientific activities are presented by the authors [5, 6], describing new paradigms of building a quality educational environment. Previous GAP [7], SWOT [8], PESTLE [9] or other analysis of the academic and scientific environment at the local and national levels can decide to define specific indicators.

One method or another necessarily ends with the ranking of participants of the assessment in absolute, consolidated or comparative terms. Ranking is the HEI's view of their activities in comparison. Determination of econometric indicators

[10], change in approaches to the development of the HEI model [11], improvement of research methods [12] and introduction of innovations based on the results of scientific activity [13] are the principal results and challenges according to the consequences of ranking. Establishing the impact of scientific activities on other activities of the HEI, as suggested by the authors [14] in the future, can be an effective tool for determining the success of the institution.

Unsolved aspects of the problem. One of the defining (along with the international accreditation of educational programs and research areas, the level of representation of scientists in the scientific space) tools for assessing the quality of educational and research activities involves free agency rankings from international agencies. At present, only a small part of the HEIs of Ukraine can take relatively high places and credit points in the known rankings (Figs. 1–3). The indicators for

Ranking	World Rank	University	Det.	Impact Rank*	Openness Rank*	Excellence Rank*
1	1162	National Taras Shevchenko University of Kyiv	👉	1870	894	1402
2	1597	National Technical University of Ukraine Kyiv Polytechnic Institute	👉	1193	934	2847
3	1796	Sumy State University	👉	2787	1099	2459
4	2380	Kharkiv National University V.N. Karazin	👉	3586	4689	2212
5	2542	National Technical University "Kharkiv Polytechnical Institute"	👉	4599	1069	3277
6	2578	National Aerospace University "Kharkiv Aviation Institute"	👉	3924	1986	3298
7	2605	National University of Life and Environmental Sciences of Ukraine (National Agricultrual University)	👉	4856	1257	3260
8	2667	Kharkiv National University of Radio Electronics	👉	6852	1458	2722
9	2799	National Mining University of Ukraine	👉	3812	2301	3718
10	2923	Lviv Polytechnic National University	👉	5636	5954	1621

Fig. 1. The place of domestic HEIs in the Webometrics ranking [15]

RANKING		SCORES			
Rank	Name Country/Region	No. of FTE Students	No. of students per staff	International Students	Female:Male Ratio
501–600	Lviv Polytechnic National University Ukraine	21,840	10.4	1%	40 : 60
501–600	Sumy State University Ukraine	9,288	10.0	14%	n/a
801–1000	Kharkiv National University of Radio Electronics Ukraine	8,058	11.8	9%	20 : 80
1001+	Ivan Franko National University of Lviv Ukraine	18,646	10.2	1%	65 : 35
1001+	National Technical University "Kharkiv Polytechnical Institute" Ukraine	12,141	8.0	9%	31 : 69
1001+	National Technical University of Ukraine – Igor Sikorsky Kyiv Polytechnic Institute Ukraine	21,072	10.4	3%	39 : 61
1001+	Taras Shevchenko National University of Kyiv Ukraine	23,687	8.9	4%	58 : 42
1001+	V.N. Karazin Kharkiv National University Ukraine	17,113	8.8	27%	55 : 45
1001+	Yurii Fedkovych Chernivtsi National University Ukraine	12,616	10.7	0%	57 : 43

Fig. 2. The place of domestic HEIs in the Times Higher Education ranking [16]

# RANK	UNIVERSITY	LOCATION	COMPARE	STARS*
2021	University search	Ukraine	↓	Rated only
-477	V. N. Karazin Kharkiv National University	Ukraine	☐	
601-650	Taras Shevchenko National University of Kyiv	Ukraine	☐	
651-700	National Technical University "Kharkiv Polytechnical Institute"	Ukraine	☐	
701-750	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"	Ukraine	☐	
701-750	Sumy State University	Ukraine	☐	
801-1000	Lviv Polytechnic National University	Ukraine	☐	

Fig. 3. The place of domestic HEIs in the Quacquarelli Symonds ranking [17]

the evaluation of a particular type of the HEI's activity and data from expert surveys are unified for institutions around the world. At the same time, Ukrainian HEIs have scores below average or low on many indicators because their assessment specifics at the national level differ from the international approach. It is a significant disadvantage when using only one tool proposed by global rankings or the relevant ministry.

Specific indicators proposed, for example, to calculate the indicators of state certification of HEIs in terms of their scientific activities, the distribution of state budget expenditures between HEIs based on indicators of their educational, scientific and international activities, are not inherent in international rankings and can identify other leaders. Therefore, an essential task in assessing exclusively domestic HEIs' educational and scientific activities is to combine their recognition indicators in the international and national arena.

Purpose. The purpose of this work is to create an integrated methodology for assessing the educational and scientific activities of HEIs, considering both the recommendations of international ranking agencies and specific indicators that consider the institution's position at the national level.

Methods. A combined method to evaluate the HEIs' activities was used in the framework of the presented work. Specific evaluation indicators are defined as inherent/non-inherent (free or partial); others have a specific numerical value.

The calculation of the final indicator of the ranking is based on comparing free economic indicators according to the indicators proposed in the methodology, which characterize the ranking positions in the world educational and scientific space, indicators of educational quality, financial indicators, and quality of the scientific activity I_i . The ranking of HEIs is based on the sum of indicators (in fractions of a unit). In addition to the total number of indicators (each – from 0 to 1, depending on the comparison with the maximum reached by the free leader), an indicator of the influence x_i of an indicator can be added, as suggested, for example, by the ranking agency Quacquarelli Symonds. Then the calculation will look like

$$R = \sum_{i=1}^n x_i \cdot I_i, \quad (1)$$

Another way of ranking can be to organize the HEI in order of lowering the ranking. In this case, for each indicator, I_i HEI receives a ranking of P_i . Accordingly, the leader of the ranking is defined as

$$\sum_{i=1}^n P_i = \min \text{ among all HEIs participating in the ranking.}$$

Calculations are made for 3–5 years. For ranking, it is proposed to use the average size of indicators for a certain period. The technique allows comparisons to be made both for all indicators and for a single indicator.

Table 1

Indicators of effectiveness and innovation of scientific activity in international rankings

Ranking	Indicator and comment
UMR	The share of international patents co-authored with business representatives for ten years, recorded by the PatStat database of the European Patent Office (EPO)
UMR	The share of scientific papers published in publications indexed by the Web of Science database for the last 4 years, which have been cited in international patents registered with the PatStat EPO database
UMR	The number of international patents for 10 years, registered by PatStat EPO database
UMR	The ratio of the number of international patents for 10 years, recorded by the database PatStat EPO, to the total number of students as of the last year
Scimago	The total number of scientific publications of the university, published in the database Scopus for the last 5 years, cited in patents registered with the database PatStat EPO
Scimago	Percentage of scientific publications published in the Scopus database for the last 5 years, cited in patents registered with the PatStat EPO database
CWUR	The total number of international patents registered with the PatentScope database of the World Intellectual Property Organization (WIPO), published in the last 9 years
Reuters	The number of patents registered in the PatentScope WIPO database
Reuters	Patent success – the ratio of patents registered in the database PatentScope WIPO to grants for the period under study
Reuters	International patents – the percentage of patents applied for at the patent offices of the United States (US Patent & Trademark Office), Europe (EPO) and Japan (Japan Patent Office)
Reuters	Patent citations – the number of sources of patents from the database PatentScope WIPO other patents from this database as a reflection of the impact on further studies
Reuters	Percentage of cited patents – the percentage of patents from the database PatentScope WIPO, cited by other patents from this database
Reuters	Influence of citations of articles on patents – the number of sources of academic publications from the WoS database in patents from the PatentScope WIPO database

Results. It is necessary to give examples of different interpretations of certain activities of the HEI in the international and domestic scientific space:

1. An indicator of the quality of trained graduates is their employment, career features and financial characteristics of the workplace. At present, there is no monitoring of a graduate's career at the system level in Ukraine (this methodology should be developed and implemented by the Ministry of Education and Science), so it is necessary to find analogues for evaluation. Such an analogue can be a ranking of universities from employers by specialities (areas) (Fig. 4).

2. The quality of research and a specific type of effectiveness and innovation of this indicator at the international level are assessed by the number of patents indexed by PatStat and PatentScope databases. Different interpretations of this indicator in different rankings are shown in Table 1.

Since domestic HEIs hardly generate such patents, it is necessary to introduce a specific analogue of this indicator, although unequal: the number of patents, applicants and patent owners of which are HEIs.

Statistics for this indicator by the reports of Ukrpatent "Industrial Property in Figures" for the top ten HEIs are given in Table 2.

3. An indicator of the effectiveness of implementing scientific results in international rankings is the number of licenses sold for the use of intellectual property rights. In domestic practice, such an indicator of effectiveness is the amount of revenue from scientific and scientific-technical work on projects of international cooperation, the results of scientific and scientific-technical work under economic agreements and the results of scientific services. As an example, Table 3 shows the top ten domestic HEIs in terms of revenues to the special fund.

The need to raise funds from third-party customers for research and development and research services is extremely urgent due to the constant reduction of state funding for research. As shown in Fig. 5 [21], over the last four years, certain stability in financing has been achieved (2 times lower than at the beginning of 2010), which should be accepted, and other ways to increase financial autonomy should be sought.

According to [21], in 2018, the share of total research expenditures in the GDP of the EU-28 countries averaged 2.12 %. In the following countries, it was higher than the average: Sweden – 3.32 %, Austria – 3.17 %, Denmark – 3.03 %, Germany – 3.13 %, Finland – 2.75 %, Belgium – 2.76 %, France – 2.02 %; it was less in Northern Macedonia, Romania, Malta and Cyprus (from 0.36 to 0.57 %). In Ukraine, this figure in 2018 was 0.48 %. It is not the lowest figure; however, according to the annual report of the National Agency for Quality Assurance in Higher Education [22] "... in absolute terms in dollar terms funding for education and higher education, and science is very low. And the problem here is not that the state does not allocate enough funds for education, but that it does not earn enough to make this percentage of GDP high..."

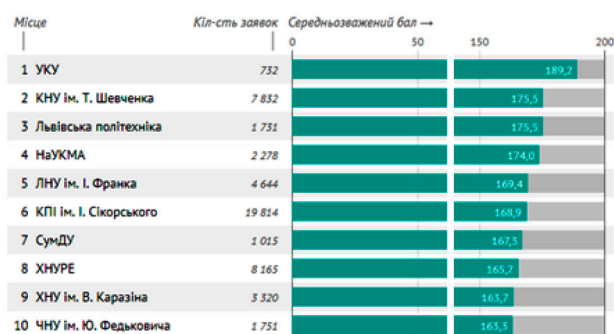


Fig. 4. DOU ranking of HEIs for IT industry 2020 [18]

In this case, it is necessary to develop both an evaluation tool and a motivation tool (based on comparing one's positions with others' positions) of the HEI to intensify activities in this direction.

3. A specific indicator of the HEI's scientific ranking is the HEI Hirsch index, which is not inherent in international rankings. Analysis of the data in Table 4 shows that in some cases the University's Hirsch index is formed due to high-ranking publications. This fact must be considered when assessing the effectiveness of the HEI's scientific activities.

According to the above statistics, based on different indicators, different universities can be leaders. Quality assessment from international agencies highlights a relatively narrow range of domestic HEIs. Evaluation according to the national indicators can make other HEIs leaders. It is essential to consider the university's scale and bring specific indicators to the number of people who provide them.

The leading indicators of the integrated methodology for assessing the HEI quality of educational and scientific activities are presented in Fig. 6.

Table 2

The patent activity of HEIs (2015–2019) [19]

Ranking	HEI	Number of patents for utility model and invention
1	National Pirogov Memorial Medical University, Vinnytsia Research Institute for Rehabilitation of Persons with Disabilities (educational-scientific-medical complex) of National Pirogov Memorial Medical University, Vinnytsia	3 138
2	National University of Food Technology	1 578
3	National University of Life and Environmental Sciences of Ukraine	1 208
4	National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”	1 074
5	National Aerospace University “Kharkiv Aviation Institute”	688
6	Tavriya State Agrotechnological University	661
7	Vinnytsia National Technical University	606
8	I. Horbachevsky Ternopil National Medical University of the Ministry of Health of Ukraine	588
9	Odesa National Academy of Food Technologies	537
10	Bukovinian State Medical University	520

Table 3

Receipts to the special fund of HEIs (2016–2018) [20]

Ranking	HEI	Receipts to the special fund, UAH million
1	Igor Sikorsky Kyiv Polytechnic Institute	106.06
2	Sumy State University	53.09
3	Lviv Polytechnic National University	50.63
4	National University of Life and Environmental Sciences of Ukraine	44.85
5	Prydniprovsk State Academy of Civil Engineering and Architecture	37.53
6	National University of “Kyiv-Mohyla Academy”	37.01
7	Kryvyi Rih National University	34.08
8	National Aerospace University “Kharkiv Aviation Institute”	33.84
9	Dnipro National University of Railway Transport named after academician V. Lazaryan	30.76
10	National Technical University “Kharkiv Polytechnic Institute”	30.28

I_1 – the presence in international academic rankings. In the case of presence in the rankings from the list determined by the methodology for each ranking HEI receives k_i in shares of one; with $\sum_{i=1}^n k_i = 1$. This approach allows us to trace the completeness of HEIs in the international space, in contrast to the system that states the presence/absence of HEIs in one of the

listed rankings. Simultaneously, it becomes possible to change the k_i indicator in a different ranking period for each of the rankings. Such a tool can increase HEIs in areas where there is a systemic lag at the state level.

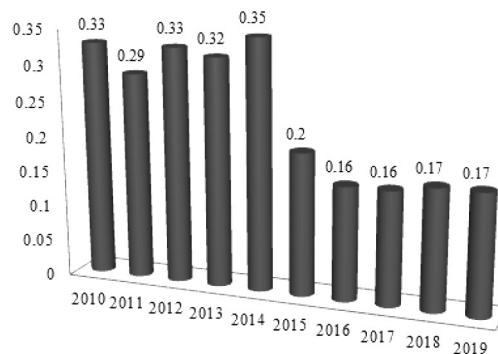


Fig. 5. GDP science-intensity: state budget funds

Table 4

HEI Hirsch index (April, 2020) [23]

Ranking	HEI	Hirsch index, number of publications, number of citations
1	Kyiv National University named after Taras Shevchenko	93 18 844 114 254
2	Kharkiv National University named after V. N. Karazin	73 10 110 61 988
3	Lviv National University named after Ivan Franko	64 7272 44 141
4	Odesa National University named after I. I. Mechnikov	62 3673 22 754
5	Yuriy Fedkovych Chernivtsi National University	61 3708 17 879
6	NTUU “Kyiv Polytechnic Institute named after Igor Sikorsky”	60 8518 29 551
7	Donetsk National Medical University	48 1363 8970
8	Lviv Polytechnic National University	45 7573 25 429
9	Sumy State University	45 2745 17 345

I_2 – feedback from employers. Due to the lack of a reliable and systematic tool for tracking graduates’ careers (as mentioned earlier), it is proposed to use rankings from employers in general or rankings of employers by industry to determine this indicator. The method for defining indicator I_2 is similar to the above method for calculating indicator I_1 .

I_3 – the level of intellectual property protection. To determine this indicator, it is necessary to calculate the number of patents, whose applicant and patent owner is the HEI in relation to the number of persons in the HEI who must provide this indicator

$$\Pi_3 = \frac{m_3 \cdot F_3}{(N_1 + N_2 + N_3 + N_4)^{p_3}}, \quad (2)$$

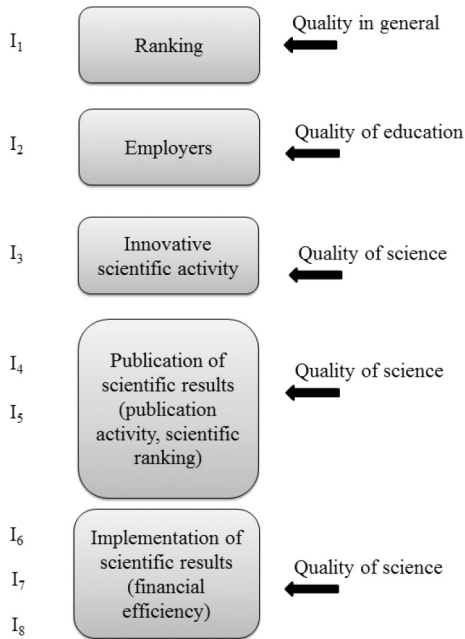


Fig. 6. Indicators of integrated methods for assessing the quality of educational and scientific activities of the HEI

where F_3 is the number of patents for a certain period; N_1 is the number of full-time research and teaching staff; N_2 is number of full-time employees-executors of state contract and state budget research, grants; N_3 is the number of doctoral students; N_4 is the number of graduate students and applicants; m_3, p_3 is the coefficient and indicator of degree.

To calculate the denominator of (2) and subsequent formulas, where there is a reduction in the number of employees, it is necessary to provide an explanation.

The indicator N_1 determines the total number of employees involved in the educational process, who are in the staff of academic structural units (departments). Indicator N_2 shows researchers who do not belong to the first category and work as full-time employees in the framework of work with funding from general or special funds for research. In the case of a part-time job, employees are considered only regarding N_1 indicator. Indicator N_3 was introduced for the following reasons. Doctoral students are students and can be accepted at the principal place of work in combination with studies. In this case, they should be allocated to a separate group. In case of combining work with training, they are transferred to indicator N_1 . The exact mechanism is used to calculate indicator N_4 . Thus, the division into categories is clear; the classes (except for the cases of doctoral and postgraduate students, which is easy to calculate) do not intersect and form a general group of persons who should provide ranking indicators.

Starting now, m_j, p_j are selected empirically and used to smooth the function Π_j if a single indicator HEI-leader is well ahead of others.

The denominator of (2) in terms of the number of persons who theoretically contribute to the formation of the indicator can be adjusted for indicator I_3 and other indicators, where the relative number of persons is determined. In the future, the total denominator is given in the formulas for estimating the minimum value Π_j . After the calculation of Π_j , the ranking of HEIs is performed. The leader receives $I_j = 1$, the others get a proportional value from 0 to 1.

Indicator I_3 allows you to change the ranking conditions, taking into account domestic patents and/or patents of other states under the approved list.

$$F_3 = F_3^{dom} + \sum_{i=1}^n F_{i3}^{in}, \quad (3)$$

where F_3^{dom} is the number of domestic patents; $\sum_{i=1}^n F_{i3}^{in}$ is the number of patents of other states.

I_4 – publishing activity. To determine this indicator, it is necessary to calculate the share of articles published on behalf of the HEI in the first and second quartiles of the Scimago Journal & Country Rank (SJR) about the number of persons in the HEI who should provide this indicator.

The calculation for the HEI, in general, is carried out similarly to the definition of indicator I_3 , considering the introduction into the denominator of the total number of articles published in publications that are accounted for, such as Scopus database and/or Web of Science Core Collection.

$$\Pi_4 = \frac{m_4 \cdot F_4^{Q_1+Q_2}}{F_4(N_1 + N_2 + N_3 + N_4)^{p_4}}, \quad (4)$$

where $F_4^{Q_1+Q_2}$ is the number of articles in the editions of the first and second quartiles by Scimago Journal & Country Rank (SJR) ranking; F_4 is the number of articles published in publications that account for the Scopus database and/or the Web of Science Core Collection.

If the ranking according to I_4 indicator is based on the field of knowledge (scientific speciality), it is worth using the coefficients of reduction of the number of articles to the scientific speciality, according to Quacquarelli Symonds. The ranking agency sets a threshold value for the number of articles for five years within the scientific speciality as a condition for entering the local ranking. In this case, the indicator $F_4^{Q_1+Q_2}$ and F_4 is adjusted by the coefficient of publication activity for the i^{th} scientific speciality B_i and (4) will take the form

$$\Pi_4 = \frac{m_4 \cdot (F_4^{Q_1+Q_2} / B_i)}{F_4(N_1 + N_2 + N_3 + N_4)^{p_4}}. \quad (5)$$

I_5 – scientific ranking. According to Table 4 of the Hirsch Index (hereafter as of December 31 of the last year of the three-year or five-year ranking period), the following approach is proposed. Each range of indicators of the Hirsch index has the indicator I_5 from 0 to 1. For example, for the Hirsch index range from 0 to 5, $I_5 = 0.1$; for the range of the Hirsch index from 20 to 30, $I_5 = 0.4$, and so on. The limits of the ranges and the weight value of indicator I_5 for a certain range may change depending on the rate of increase in the Hirsch index of the HEI in different ranges.

I_6 – financial efficiency (receipts to the general fund of the HEI). This indicator is also reduced to the number of persons in the EIA. They have to provide this indicator and consider the different degree of influence of each of the sources of income C (state funding of bilateral research projects, research funding to be carried out at the expense of the general budget). The available form of the formula for calculating this indicator is as follows

$$\Pi_6 = \frac{m_6 \cdot \sum_{i=1}^n F_{6i} \cdot C_i}{(N_1 + N_2 + N_3 + N_4)^{p_6}}, \quad (6)$$

where F_{6i} is receipts to the general fund of HEIs under the corresponding articles; N_2' is the number of full-time employees performing scientific work with funding from the general fund of HEIs.

I_7 – financial performance (receipts to the special fund of the HEI). Indicator I_7 is calculated in the same way as indicator I_6 . Peculiarities of calculating this indicator are the emergence of new sources of funding for the special fund of the HEI – grants of the National Research Fund, economic contract work commissioned by the state (for example, scientific and technical development by state order), financial contract work commissioned by domestic individuals and legal entities, orders of foreign organizations, and so on) – each of which is

characterized by a different degree of influence D_i . The formula for calculating the indicator is

$$\Pi_7 = \frac{m_7 \cdot \sum_{i=1}^n F_{7i} \cdot D_i}{(N_1 + N_2'' + N_3 + N_4)^{p_7}}, \quad (7)$$

where F_{6i} is admission to the special fund of the HEI under the relevant articles; N_2'' is the number of full-time employees performing research work with funding from the special fund of the HEI.

I_8 – financial efficiency (the ratio of revenues to special and general funds of the HEI). This indicator considers the efficiency of the use of funds from the general fund of the state budget. The state's order for the performance of scientific works pursues the receipt of practically significant results, which should be transformed into income to the special fund. Otherwise, the efficiency of work at the expense of the state budget's general fund is questionable or absent.

The calculation of the indicator for this indicator is as follows

$$\Pi_8 = \Pi_7 / \Pi_6. \quad (8)$$

Conclusions. The proposed integrated methodology for assessing the educational and scientific activities of HEIs allows creating an effective tool for influencing the institution's financial performance in the future.

In addition to determining the place in the ranking of HEIs for individual indicators and in general, this technique allows you:

- to determine the relative contribution of the university to the formation of the national index on indicators I_3, I_4, I_6, I_7 , which characterize the level of innovation and financial capacity;
- to define the level of financial independence of the HEI at the ratio of indicator Π_7 to the amount of state funding for full-time students.

The indicators are given in the methodology, and the above indicators are an assessment of the socio-economic impact of a particular HEI in the development and intensification of a particular area of activity at the national level.

In the future, the presented integrated methodology can be improved in response to the challenges of international rankings, Sustainable Development Goals 2030, and so on.

Acknowledgments. This work was carried out under the project "Reforming the lifelong learning system in Ukraine to prevent labor emigration: a cooperative model of institutional partnership", state registration No. 0120U102001.

References.

1. Vasylieva, T. A., & Kasyanenko, V. O. (2013). Integral assessment of innovation potential of Ukraine's national economy: A scientific methodical approach and practical calculations. *Actual Problems of Economics*, 144(6), 50-59. Retrieved from <https://eco-science.net/downloads/>.
2. Vorontsova, A., Vasylieva, T., Bilan, Y., Ostasz, G., & Mayboroda, T. (2020). The influence of state regulation of education for achieving the sustainable development goals: Case study of central and eastern european countries. *Administratie Si Management Public*, 2020(34), 6-26. <https://doi.org/10.24818/amp/2020.34-01>.
3. Lyeonov, S., & Liuta, O. (2016). Actual problems of finance teaching in Ukraine in the post-crisis period. In T., Azarmi, & W., Amann (Eds.). (2016). *The financial crisis: Implications for research and teaching*, (pp. 145-152). <https://doi.org/10.1007/978-3-319-20588-5>.
4. Bercovitz, J., & Feldman, M. (2006). Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. *Journal of Technology Transfer*, 31(1), 175-188. <https://doi.org/10.1007/s10961-005-5029-z>.
5. Hanushek, E. A. (2005). Why quality matters in education. *Finance and Development*, 42(2), 15-19. Retrieved from https://www.researchgate.net/publication/252555388_Why_Quality_Matters_in_Education.
6. Todorut, A. V. (2016). A new architecture of quality in education. *Quality – Access to Success*, 17(153), 60-63. Retrieved from <https://www.srac.ro/calitatea/en/arhiva/2016/2016-04-Abstracts.pdf>.

7. Mantovani, D., Gouvea, M., & Conejero, M. (2013). Quality Gap Analysis on Education Services. *International Journal of Advances in Management and Economics*, 2(5), 30-39. Retrieved from https://www.humanities.mn/fileman/Uploads/MD_handbook/Erdenechimeg.E/3%20ARTICLE%20IN%20GAP%20ANALYSIS%20IN%20EDUCATIONAL.pdf.

8. Keban, Y. B., Arifin, S., & Wahyono, R. (2019). SWOT Analysis and Its Implementation Strategies in Educational Management. *Journal of Education and Practice*, 10(12), 86-92. <https://doi.org/10.7176/JEP/10-12-10>.

9. Cox, J. (2021). The higher education environment driving academic library strategy: A political, economic, social and technological (PEST) analysis. *The Journal of Academic Librarianship*, 47(1), 102219. <https://doi.org/10.1016/j.acalib.2020.102219>.

10. Ehrenberg, R. G. (2004). Econometric Studies of Higher Education. *Journal of Econometrics*, 121, 19-37. <https://doi.org/10.1016/j.jeconom.2003.10.008>.

11. Hazelkorn, E. (2013). How Rankings are Reshaping Higher Education. in Climent, V., Michavila, F., & Ripolles, M. (Eds.) (2013). *Los Rankings Universitarios. Mitos y Realidades*. Retrieved from <https://arrow.tudublin.ie/cserbk/23/>.

12. Vernon, M. M., Balas, E. A., & Momani, S. (2018). Are university rankings useful to improve research? A systematic review. *PLoS ONE*, 13(3), e0193762. <https://doi.org/10.1371/journal.pone.0193762>.

13. Keupp, M. M., Palmié, M., & Gassmann, O. (2012). The strategic management of innovation: A systematic review and paths for future research. *International Journal of Management Reviews*, 367-390. <https://doi.org/10.1111/j.1468-2370.2011.00321.x>.

14. Sutherland, W. J., Goulson, D., Potts, S. G., & Dicks, L. V. (2011). Quantifying the Impact and Relevance of Scientific Research. *PLoS ONE*, 6(11), e27537. <https://doi.org/10.1371/journal.pone.0027537>.

15. *Ranking WEB of Universities* (n.d.). Retrieved from <http://webometrics.info/en>.

16. *World University Rankings. THE (Times Higher Education)* (n.d.). Retrieved from <https://www.timeshighereducation.com/world-university-rankings>.

17. *QS World University Rankings* (2021). Retrieved from <https://www.topuniversities.com/university-rankings/world-university-rankings/2021>.

18. *Ranking of universities for the IT industry 2020* (2020). Retrieved from <https://dou.ua/lenta/articles/ukrainian-universities-2020/>.

19. *State Enterprise "Ukrainian Institute of Intellectual Property" (Ukrpatent)* (n.d.). Retrieved from <https://ukrpatent.org/>.

20. *Ministry of Education and Science of Ukraine* (n.d.). Retrieved from <https://mon.gov.ua/ua>.

21. Pisarenko, T. V., & Kuranda, T. K. (2020). *Scientific and scientific-technical activity in Ukraine in 2019: scientific-analytical report*. Kyiv: UkrINTEI. Retrieved from <https://mon.gov.ua/storage/app/media/nauka/informatsiyno-analitychni/2020/08/13/nadnaukaza2019-stisnuto.pdf>.

22. *NAQA Annual Report: 2019* (2020). Retrieved from <https://naqa.gov.ua/wp-content/uploads/2020/02/%d0%97%d0%b2%d1%96%d1%82-2020.pdf>.

23. *Ranking of universities according to Scopus database 2020* (2020). Retrieved from <http://osvita.ua/vnz/rating/72780/>.

Інтегральна методика оцінки якості освіти та діяльності університету

A. Є. Артюхов, Т. А. Васильєва, С. В. Леонов

Сумський державний університет, м. Суми, Україна, e-mail: a.artukhov@pohnp.sumdu.edu.ua

Мета. Створення інтегральної методики оцінювання освітньо-наукової діяльності закладів вищої освіти (ЗВО) з дотриманням як рекомендацій міжнародних рейтингових агентств, так і специфічних показників, що враховують позиції закладу на національному рівні.

Методика. Застосовано комбіновану методику оцінки діяльності ЗВО. Певні індикатори оцінки визначаються такими, що притаманні/непритаманні ЗВО (повністю або частково), інші мають конкретне числове значення. В основі розрахунку підсумкового показника рейтингової оцінки лежить порівняння

ЗВО за запропонованими в методиці індикаторами (рейтингові позиції у світовому освітньо-науковому просторі, показники якості освіти, фінансові показники та якість наукової діяльності) з еталонним ЗВО, що має найкращий результат за кожним конкретним індикатором.

Результати. Представлено алгоритм визначення кожного індикатора інтегральної методики оцінки освітньо-наукової діяльності ЗВО та надані рекомендації щодо застосування кожного з індикаторів залежно від особливостей рейтингування (наприклад, загальний рейтинг чи рейтинг за напрямом).

Наукова новизна. Запропонована інтегральна методика зовнішньої оцінки освітньо-наукової діяльності з урахуванням як загальновідомих індикаторів світових рейтингових агентств, так і специфічних (відмінних від сві-

тових рейтингових показників) індикаторів оцінки активностей ЗВО на національному рівні.

Практична значимість. Методика дозволяє визначити окремі економічні показники динаміки (позитивної чи негативної) розвитку ЗВО та знайти «вузькі» місця в реалізації певних активностей в освітньо-науковій діяльності закладу. Методика враховує не лише власне освітню діяльність (підготовку здобувачів вищої освіти всіх рівнів), але й дозволяє оцінити успішність ЗВО в реалізації наукової діяльності як основного фактору створення нових знань і підвищення якості надання освітніх послуг.

Ключові слова: *якість освіти, трансфер технологій, економічний розвиток, методика оцінки, зовнішня оцінка*

Recommended for publication by O. V. Lyulyov, Doctor of Economical Sciences. The manuscript was submitted 07.12.20.