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ASSESSMENT OF THE LEVEL OF INNOVATIVE DEVELOPMENT USING FACTOR ANALYSIS

The factor analysis of the indicators characterizing innovative development of the state for the period of 2010-2019 is carried out, by means of a method of the modified main component the generalizing indicator is constructed. The calculation of the generalized indicators of level of innovative development (LID) in 2010-2019 was carried out using the software SPSS 21.

These practical recommendations can be applied not only in the Ukrainian business space, but also in the business of countries that have chosen innovative development.

For the first time, an integrated indicator was proposed – the level of innovative development of socio-economic systems (states, regions). A method for calculating an integrated indicator of the level of innovative development of Ukraine, which includes institutional, social, economic, scientific, informational, educational and financial components of innovative development, has been developed.

Key words: *innovative development, factor analysis, level of innovative development, assessment, methodology, unified indicator, potential.*

Introduction. A new, complex stage of socio-economic development of Ukraine requires meticulous attention to issues of innovative development. Territorially, Ukraine is characterized by uneven socio-economic and innovative development. This unevenness is determined by factors of an objective nature, as well as subject-political, political-managerial, etc. Exogenous system of innovative development, characterized by the projection of innovation policy at the macro and meso level, and endogenous system, determined by innovative development at the micro level - complementary systems. Therefore, it is quite logical to assess the level of innovative development of the whole country for all groups of indicators: institutional and social, information and educational, financial, scientific and economic potential.

Literature review. In general, the problem of studying the state of innovative development of the country and territories is characterized by the continuity of the search and the thoroughness of the research. However, so far some issues related to the in-depth assessment of the level of innovative development of Ukraine have not received a complete and appropriate scientific solution, and therefore require additional theoretical justification and methodological elaboration. Theoretical-methodical and factual material of the article is based on the works of Ukrainian scientists S. Shkarlet, V. Ilchuk [1], V. Mysyliuk [2], V. Voloshchuk [3], K. Koledina [4] and other scientists [1-5], as well as data from the State Statistics Service of Ukraine and regional statistics departments [6].

Among the methods of assessing the level of innovative development of enterprises deserves special attention proposed by scientists S. Shkarlet and V. Ilchuk method on the level of innovative development of industrial enterprises for three groups of indicators: resource, technological and market component of innovative development [1].

The purpose of the article. The main task of this study is to develop a method for calculating the integrated indicator of the level of innovation development at the stage of exogenous innovation process management system in order to identify the state and trends of innovation potential of Ukraine.

Results and discussions. Based on the data of the State Statistics Service of Ukraine [6], which characterize the level of innovative development of the country in 2010-2019, among the a posteriori sets of initial statistical indicators selected 55, among them:

$\widetilde{V}_1$ – number of large enterprises, units;	$\widetilde{V}_{27}$ – costs for research and development by type of work, thousand UAH;
$\widetilde{V}_2$ – number of medium-sized enterprises, units;	$\widetilde{V}_{28}$ – volume of services provided by enterprises in the field of research and development, thousand UAH;
$\widetilde{V}_3$ – number of small enterprises, including microenterprises, units;	$\widetilde{V}_{29}$ – number of introduced new technological processes, units;
$\widetilde{V}_4$ – number of industrial enterprises, units;	$\widetilde{V}_{30}$ – number of names of introduced innovative types of products, units;
$\widetilde{V}_5$ – employed population in the field of education, information, telecommunications, professional, scientific and technical activities, thousand people;	$\widetilde{V}_{31}$ – the number of employees involved in the implementation of research and development - in total, persons;
$\widetilde{V}_6$ – value added at the costs of production of economic entities in the field of information and telecommunications, thousand UAH;	$\widetilde{V}_{32}$ – volume of services provided by enterprises in the field of education, thousand UAH;
$\widetilde{V}_7$ – value added at the costs of production of economic entities in the field of education, thousand UAH;	$\widetilde{V}_{33}$ – volume of services provided by enterprises in the field of information and telecommunications, thousand UAH;
$\widetilde{V}_8$ – value added at the costs of production of economic entities in the field of professional, scientific and technical activities, thousand UAH;	$\widetilde{V}_{34}$ – number of business entities in the field of information and telecommunications, units;
$\widetilde{V}_9$ – number of industrial enterprises engaged in innovations, units;	$\widetilde{V}_{35}$ – number of business entities in the field of professional, scientific and technical activities, units
$\widetilde{V}_{10}$ – volume of products sold by large enterprises, UAH million;	$\widetilde{V}_{36}$ – number of business entities in the field of education units;
$\widetilde{V}_{11}$ – volume of products sold by medium-sized enterprises, UAH million;	$\widetilde{V}_{37}$ – share of ICT exports in total exports,%;
$\widetilde{V}_{12}$ – volume of products sold by small enterprises, UAH million;	$\widetilde{V}_{38}$ – number of Internet subscribers, thousand people;
$\widetilde{V}_{13}$ – volume of sold products (goods, services) of enterprises using low-level technologies;	$\widetilde{V}_{39}$ – share of people using the Internet,%;
$\widetilde{V}_{14}$ – the volume of sold products (goods, services) of enterprises using medium-low technologies;	$\widetilde{V}_{40}$ – retail turnover of retail trade enterprises, UAH million;

$\widetilde{V}_{15}$ – the volume of sold products (goods, services) of enterprises using medium-high technologies;	$\widetilde{V}_{41}$ – number of higher education institutions, units;
$\widetilde{V}_{16}$ – volume of sold products (goods, services) of enterprises with the use of high technologies;	$\widetilde{V}_{42}$ – number of students in higher education institutions, thousand people;
$\widetilde{V}_{17}$ – share of large enterprises that made a profit,%;	$\widetilde{V}_{43}$ – average monthly salary of full-time employees in the field of education, UAH;
$\widetilde{V}_{18}$ – the share of medium-sized enterprises that made a profit,%;	$\widetilde{V}_{44}$ – average monthly salary of full-time employees in the field of professional, scientific and technical activities, UAH;
$\widetilde{V}_{19}$ – share of small enterprises that made a profit,%;	$\widetilde{V}_{45}$ – average monthly salary of full-time employees in the field of information and telecommunications, UAH;
$\widetilde{V}_{20}$ – the share of sold innovative products in the volume of sold industrial,%;	$\widetilde{V}_{46}$ – number of international scientific publications;
$\widetilde{V}_{21}$ – volume of sold industrial products, UAH million;	$\widetilde{V}_{47}$ – applications of residents for industrial design;
$\widetilde{V}_{22}$ – GDP per capita, UAH;	$\widetilde{V}_{48}$ – patent applications of residents;
$\widetilde{V}_{23}$ – disposable income per person, UAH;	$\widetilde{V}_{49}$ – total amount of expenses for innovations, thousand UAH;
$\widetilde{V}_{24}$ – volume of exports of goods, thousand dollars USA;	$\widetilde{V}_{50}$ – capital investments in intangible assets, thousand UAH;
$\widetilde{V}_{25}$ – volume of exports of services, thousand dollars USA;	$\widetilde{V}_{51}$ – research and development costs (in% of GDP);
$\widetilde{V}_{26}$ – share of industrial enterprises engaged in innovations,%;	$\widetilde{V}_{52}$ – foreign direct investment, million dollars USA.

* $\widetilde{V}_1 \ldots \widetilde{V}_5$ – institutional and social potential;

$\widetilde{V}_6 \ldots \widetilde{V}_{25}$ – economic potential;

$\widetilde{V}_{26} \ldots \widetilde{V}_{31}$ – scientific potential;

$\widetilde{V}_{32} \ldots \widetilde{V}_{48}$ – information and educational potential;

$\widetilde{V}_{49} \ldots \widetilde{V}_{52}$ – financial potential.

One of the sections of multidimensional statistical analysis that combines methods for estimating the dimensionality of many observed variables by studying the structure of covariance or correlation matrices is factor analysis, which should be used in analyzing the level of innovative development of socio-economic systems micro-, meso- and macro-level. That is why one of the methods of multidimensional statistics – the method of main components – was used to build a generalized indicator of the level of innovation development and generalized indicators for the defined five groups.

An appropriate procedure for measuring the level of innovation development is the preliminary unification of the selected baselines, i.e. the application to them of such a transformation, as a result of which they will all be measured on an N – scale. In this case, the zero value of the transformed indicator will correspond to the lowest level of innovative development, and the maximum value of N – the highest. Such unification will ensure comparability and comparability of the formed information base.

For stimulus indicators, the growth of which contributes to the increase of the indicator, the value of the corresponding unified variable was calculated by the formula [7; 8]:

$$v_{irj} = \frac{\tilde{v}_{irj} - \tilde{v}_{rj\,\min}}{\tilde{v}_{rj\,\max} - \tilde{v}_{rj\,\min}} N, \qquad (1)$$

v_{irj} – the i-th value of the j-th initial unified indicator of the r-th aspect of the level of innovation development (LID) V_{rj} ($i = \overline{1, n}$, $r = \overline{1,10}$, $j = \overline{1, m_r}$, n – the number of observations of the baseline V_{rj}, m_r – the number of baselines of the r-th aspect of LID considered); $\tilde{v}_{irj}$ – the i-th value of the j-th original non-unified indicator of the r-th aspect of LID $\tilde{V}_{rj}$; $\tilde{v}_{rj\,\min}$ – the minimum value of the j-th original non-unified indicator of the r-th aspect of LID $\tilde{V}_{rj}$; $\tilde{v}_{rj\,\max}$ – the maximum value of the j-th initial non-unified indicator of the r-th aspect of LID $\tilde{V}_{rj}$.

Calculation of the integrated indicator Y_r ($r = \overline{1,10}$),which characterizes certain aspects of LID, was carried out according to the formula:

$$Y_r = \sum_{j=1}^{m_r} w_{rj} V_{rj}, \qquad (2)$$

w_{rj} – the weight with which the j-th indicator of the r-th aspect of LID is taken into account when calculating the integrated indicator.

The weights w_{rj} were calculated by the modified principal component method.

The procedure for constructing the first principal component is based on the following basic idea: among all scalar variables that characterize some aspect of LID, one is found that can most accurately reconstruct (using appropriate linear regression models) the values of all partial criteria $V_1, V_2, ..., V_m$, considered (hereinafter the index r, which corresponds to the aspect of LID, is omitted). The construction of the first main component Y_1 was carried out according to the following procedure:

1. According to the initial values of the unified indicators of some aspect LID $V_1, V_2, ..., V_m$, standardized values of these indicators are calculated $V_1^*, V_2^*, \ldots, V_m^*$ and a matrix is constructed V^* standardized values of output factors and matrix R paired correlations [8]:

$$R = \frac{1}{n} V^{*T} V^*. \qquad (3)$$

2. To calculate the first principal component $X_1 = l_1 \mathbf{X}^*$ the optimization problem was solved:

$$\begin{cases} D(l_1 V^*) \to \max\limits_{l_1}; \\ l_1 l_1^T = 1, \end{cases} . \qquad (4)$$

System of equations for definition l_1 looks like:

$$(R - \lambda_1 I_m) l_1^T = 0, \qquad (5)$$

λ_1 – the largest eigenvalue of the matrix R, which is the solution of the characteristic equation $|R - \lambda I_m| = 0$; I_m – unit dimensional matrix m.

Thus, the first main component X_1 gets as a linear combination:

$$X_1(V^*) = l_1 V^*, \qquad (6)$$

l_1 – own matrix vector R, which corresponds to the largest eigenvalue λ_1 of this matrix.

As a measure of the informativeness of the first main component X_1 the share is determined k the total variance of this component in the total variance of the initial values:

$$k = \frac{D(F_1)}{D(V_1^*) + ... + D(V_m^*)}. \quad (7)$$

Whereas $D(X_1) = \lambda_1$, $D(V_1^*) = ... = D(V_m^*) = 1$, then the criterion of informativeness k can be represented as:

$$k = \frac{\lambda_1}{m}. \quad (8)$$

The area of inoperability of a single scalar indicator of some aspect of LID is determined by the inequality:

$$k < k^*. \quad (9)$$

According to the method of the modified main component in the calculations by the formula (2) as scales w_{rj} component squares were used j eigenvector l_1 covariance matrix of variables V_1, V_2,..., V_m.

The calculation of the generalized indicators of LID in 2010-2019 was carried out by means of a software statistical package SPSS 21. It was assumed that $N = 10$. Note that when calculating using the modified first principal component method, the variance explained by the first principal component for all aspects of LID considered was more than 50%, i.e. in all cases the criterion of efficiency of the method was met. In the table 1 shows the calculation of the total variance, which is explained by the first main component for the construction of a matrix of components by LID.

Table 1

Total Variance Explained

Full explained variance						
Component	Initial eigenvalues			Sums of squares of Extraction		
	Total	% Dispersion	Cumulative%	Total	% Dispersion	Cumulative%
1	3,822	76,441	76,441	3,822	76,441	76,441
2	0,898	17,953	94,394			
3	0,179	3,577	97,970			
4	0,089	1,783	99,753			
5	0,012	0,247	100,000			

Source: author's development. Extraction Method: Principal Component Analysis

The matrix of components for the first group of factors is given in table 2.

Table 2

Component Matrix

Component	Value
$\widetilde{V}_1$	0,929
$\widetilde{V}_2$	0,946
$\widetilde{V}_3$	0,887
$\widetilde{V}_4$	0,775
$\widetilde{V}_5$	0,823

Source: author's development. Extraction Method: Principal Component Analysis

Table 3 shows the calculation of the total variance (77.607%), which is explained by the first main component for the construction of a matrix of components for the second group of influencing factors $\widetilde{V}_6 \ldots \widetilde{V}_{25}$ economic potential as a component of the level of innovative development.

Table 3

Total Variance Explained

Full explained variance						
Component	Initial eigenvalues			Sums of squares of Extraction		
	Total	% Dispersion	Cumulative%	Total	% Dispersion	Cumulative%
1	15,521	77,607	77,607	15,521	77,607	77,607
2	2,578	12,889	90,496	2,578	12,889	90,496
3	0,927	4,635	95,131			
4	0,485	2,425	97,557			
5	0,251	1,256	98,813			
6	0,136	0,678	99,490			
7	0,057	0,283	99,773			
8	0,027	0,133	99,906			
9	0,019	0,094	100,000			
10	9,543E-16	4,772E-15	100,000			
11	4,387E-16	2,193E-15	100,000			
12	3,586E-16	1,793E-15	100,000			
13	2,506E-16	1,253E-15	100,000			
14	1,934E-16	9,672E-16	100,000			
15	1,331E-16	6,655E-16	100,000			
16	-1,033E-16	-5,164E-16	100,000			
17	-2,579E-16	-1,289E-15	100,000			
18	-3,566E-16	-1,783E-15	100,000			
19	-7,210E-16	-3,605E-15	100,000			
20	-1,119E-15	-5,594E-15	100,000			

Source: author's development. Extraction Method: Principal Component Analysis

The matrix of components for the second group of factors is shown in table 4.

Table 4

Component Matrix

Component	Value	Component	Value
$\widetilde{V}_6$	0,807	$\widetilde{V}_{16}$	0,915
$\widetilde{V}_7$	0,545	$\widetilde{V}_{17}$	0,174
$\widetilde{V}_8$	0,623	$\widetilde{V}_{18}$	0,867
$\widetilde{V}_9$	0,486	$\widetilde{V}_{19}$	0,918
$\widetilde{V}_{10}$	0,803	$\widetilde{V}_{20}$	-0,977
$\widetilde{V}_{11}$	0,824	$\widetilde{V}_{21}$	0,933
$\widetilde{V}_{12}$	0,847	$\widetilde{V}_{22}$	0,846
$\widetilde{V}_{13}$	0,914	$\widetilde{V}_{23}$	0,773
$\widetilde{V}_{14}$	0,786	$\widetilde{V}_{24}$	-0,818
$\widetilde{V}_{15}$	0,567	$\widetilde{V}_{25}$	-0,249

Source: author's development. Extraction Method: Principal Component Analysis

Table 5 shows the calculation of the total variance (57.029%), which is explained by the first main component for the construction of a matrix of components for the third group of factors $\widetilde{V}_{26} \dots \widetilde{V}_{31}$ scientific potential as a component of the level of innovative development.

Table 5

Total Variance Explained)

Full explained variance						
Component	Initial eigenvalues			Sums of squares of Extraction		
	Total	% Dispersion	Cumulative%	Total	% Dispersion	Cumulative%
1	3,422	57,029	57,029	3,422	57,029	57,029
2	1,541	25,683	82,712	1,541	25,683	82,712
3	0,705	11,755	94,467			
4	0,238	3,968	98,435			
5	0,091	1,520	99,954			
6	0,003	0,046	100,000			

Source: author's development. Extraction Method: Principal Component Analysis

The matrix of components for the third group of factors is given in table 6.

Table 6

Component Matrix

Component	Value
$\widetilde{V}_{26}$	-0,679
$\widetilde{V}_{27}$	-0,955
$\widetilde{V}_{28}$	0,990
$\widetilde{V}_{29}$	-0,063
$\widetilde{V}_{30}$	0,070
$\widetilde{V}_{31}$	0,978

Source: author's development. Extraction Method: Principal Component Analysis

Table 7 shows the calculation of the total variance (80.125%), which is explained by the first main component for the construction of a matrix of components, respectively, for the fourth group of factors $\widetilde{V}_{32} \ldots \widetilde{V}_{48}$ – information and educational potential as a component of the level of innovative development.

Table 7

Total Variance Explained

Full explained variance						
Component	Initial eigenvalues			Sums of squares of Extraction		
	Total	% Dispersion	Cumulative%	Total	% Dispersion	Cumulative%
1	13,621	80,125	80,125	13,621	80,125	80,125
2	1,506	8,857	88,982	1,506	8,857	88,982
3	1,034	6,082	95,063	1,034	6,082	95,063
4	0,600	3,531	98,594			
5	0,149	0,879	99,473			
6	0,040	0,234	99,707			
7	0,034	0,201	99,908			
8	0,012	0,068	99,977			
9	0,004	0,023	100,000			
10	1,007E-013	1,042E-013	100,000			
11	1,004E-013	1,025E-013	100,000			
12	1,002E-013	1,014E-013	100,000			
13	1,001E-013	1,007E-013	100,000			
14	-1,001E-013	-1,006E-013	100,000			
15	-1,002E-013	-1,014E-013	100,000			
16	-1,004E-013	-1,024E-013	100,000			
17	-1,005E-013	-1,028E-013	100,000			

Source: author's development. Extraction Method: Principal Component Analysis

The matrix of components for the fourth group of factors is given in table 8.

Table 8

Component Matrix

Component	Value	Component	Value
$\widetilde{V}_{32}$	0,803	$\widetilde{V}_{41}$	-0,562
$\widetilde{V}_{33}$	0,804	$\widetilde{V}_{42}$	-0,574
$\widetilde{V}_{34}$	0,828	$\widetilde{V}_{43}$	0,941
$\widetilde{V}_{35}$	0,544	$\widetilde{V}_{44}$	0,889
$\widetilde{V}_{36}$	0,800	$\widetilde{V}_{45}$	0,910
$\widetilde{V}_{37}$	-0,010	$\widetilde{V}_{46}$	0,896
$\widetilde{V}_{38}$	0,803	$\widetilde{V}_{47}$	0,146
$\widetilde{V}_{39}$	0,801	$\widetilde{V}_{48}$	-0,674
$\widetilde{V}_{40}$	0,880	×	×

Source: author's development. Extraction Method: Principal Component Analysis

Finally, Table 9 shows the calculation of the total variance (55.89%), which is explained by the first main component for constructing a matrix of components for the fifth group of influencing factors $\widetilde{V}_{49} \ldots \widetilde{V}_{52}$ financial potential as a component of the level of innovative development.

Table 9

Total Variance Explained

Full explained variance						
Component	Initial eigenvalues			Sums of squares of Extraction		
	Total	% Dispersion	Cumulative%	Total	% Dispersion	Cumulative%
1	2,235	55,887	55,887	2,235	55,887	55,887
2	0,888	22,198	78,086			
3	0,652	16,288	94,373			
4	0,225	5,627	100,000			

Source: author's development. Extraction Method: Principal Component Analysis

The matrix of components for the fifth group of factors is given in table 10.

Table 10

Component Matrix

Component	Value
$\widetilde{V}_{49}$	-0,517
$\widetilde{V}_{50}$	-0,790
$\widetilde{V}_{51}$	0,921
$\widetilde{V}_{52}$	0,705

Source: author's development. Extraction Method: Principal Component Analysis

Therefore, in table 11 we present the calculation of the total variance (79.086%), which is explained by the first main component for the construction of a matrix of components for the generalized indicator of the level of innovative development of Ukraine in 2010-2019.

Table 11

Total Variance Explained

Full explained variance						
Component	Initial eigenvalues			Sums of squares of Extraction		
	Total	% Dispersion	Cumulative%	Total	% Dispersion	Cumulative%
1	3,954	79,086	79,086	3,954	79,086	79,086
2	0,780	15,605	94,691			
3	0,207	4,149	98,840			
4	0,054	1,073	99,913			
5	0,004	0,087	100,000			

Source: author's development. Extraction Method: Principal Component Analysis

The matrix of components for the generalized indicator LID in 2010-2019 (Table 12).

Table 12

Component Matrix

Components	The values are calculated by the principal component method	Calculated values by the method of the modified main component
Y1	0,847	0,18576
Y2	-0,830	0,17834
Y3	0,970	0,24343
Y4	-0,892	0,20616
Y5	0,848	0,18631

Source: author's development. Extraction Method: Principal Component Analysis

The value of the integrated indicator LID is calculated as a generalized estimate (Table 13).

Table 13

The value of the integrated indicator LID

The level of innovative development and its components	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	4,47	**4,78**	**4,75**	**4,79**	**3,27**	**3,54**	**3,32**	**3,77**	**5,30**	**5,80**
– institutional and social potential (Y_1)	**8,77**	**8,36**	**7,61**	**8,50**	3,68	*2,34*	*0,20*	1,52	*3,14*	5,21
– economic potential (Y_2)	1,34	2,68	2,81	2,90	*2,50*	3,80	4,82	**6,40**	**8,12**	**8,88**
– scientific potential (Y_3)	5,84	5,80	5,65	5,31	3,81	4,39	3,94	3,43	4,26	3,38
– information and educational potential (Y_4)	*0,98*	1,84	2,38	3,18	3,33	3,90	4,74	5,99	7,03	8,82
– financial potential (Y_5)	5,26	5,13	5,20	3,99	2,82	3,00	2,60	*1,49*	4,20	*3,25*

Source: author's development

As can be seen from Table 13, the innovative development of Ukraine in the recent period was provided primarily by economic and informational and educational potential. This is confirmed by Ukraine's place in the global ranking of the Global Innovation Index and proves the close relationship of innovative development of enterprises, regions, countries and the world (according to the index of technology and knowledge economy in 2019 Ukraine took 28th and in 2020 - 25th place in the world, in terms of business development – 47th and 54th place respectively) [9]. Since 2014, Ukraine has gradually lost its position in providing institutional, social, scientific and financial potential (according to the infrastructure index as a component of the Global Innovation Index in 2019 Ukraine took 97th and in 2020 – 94th place; according to the institutional environment index – respectively 96th and 93rd place, according to the index of human capital and research – 51st and 39th place, respectively). Such «unevenness» of potentials creates preconditions for social tension in society. Thus, the dissemination of innovations as a «panacea for social pain» should be aimed at increasing financial, institutional, social and scientific capacity and consolidating economic and informational and educational.

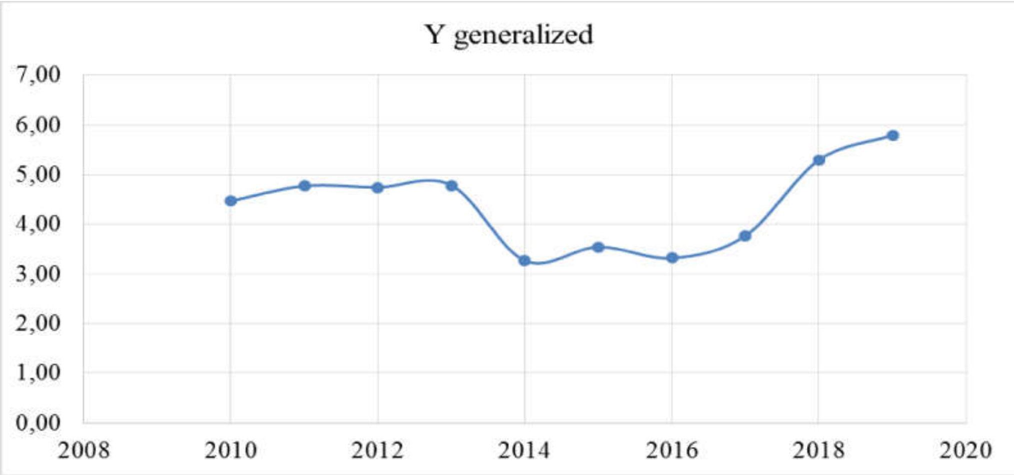

Fig. 1. Generalized indicator of the level of innovative development of Ukraine in 2010-2019
Source: author's development

Thus, the following LID model is constructed according to the generalized indicator:

$$Y_{gen\ (LID)} = a_1 Y_{1i} + a_2 Y_{2i} + a_3 Y_{3i} + a_4 Y_{4i} + a_5 Y_{5i} \quad (10)$$

Thus, the indicator of the level of innovative development of Ukraine for the period 2010-2019 had a vague upward trend; its significant growth can be observed only in 2018 (5.30) and 2019 (5.80).

Conclusions. The material presented in the article in the order of logical presentation and content reveals the author's approach to the development of methodology for assessing innovative development. The developed method of calculating the integrated indicator of the level of innovation development at the level of exogenous innovation management system allows to identify the state and trends of innovation development of Ukraine and regions and enterprises, in particular, as it covers an in-depth assessment of institutional, economic, scientific, informational and financial potential-components of innovative development. In the future, it is planned to apply the extrapolation method to the calculations in order to obtain predictive values of the integrated indicator LID.

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ОЦІНКА РІВНЯ ІННОВАЦІЙНОГО РОЗВИТКУ ЗА ДОПОМОГОЮ ФАКТОРНОГО АНАЛІЗУ

Проблема*. Україна в територіальному розрізі вирізняється нерівномірністю інноваційного розвитку. Ця нерівномірність визначається як факторами об'єктивного характеру, так і суб'єктно-політичними, політико-управлінськими тощо. Екзогенна система інноваційного розвитку, яка характеризується проєкцією інноваційної політики на макро- та мезорівень, та ендогенна система, яка визначається інноваційним розвитком на мікрорівні – взаємодоповнюючі системи. Тому цілком логічним є проведення оцінки рівня інноваційного розвитку країни за всіма групами показників: інституційно-соціальний, інформаційно-освітній, фінансовий, науковий та економічний потенціал.*

Метою *дослідження є розробка методу розрахунку інтегрального показника рівня інноваційного розвитку на етапі екзогенної системи управління інноваціями з метою виявлення стану та тенденцій інноваційного розвитку в Україні.*

Методологія. *Основними методами дослідження були аналіз та синтез, методи статистичного спостереження та узагальнення при збиранні, групуванні та аналізі статистичних даних протягом 10 років. Іншим методом був порівняльний аналіз при оцінці рівня інноваційного розвитку України, зокрема, усіх його складових. Метод також був використаний конкретними та абстрактними порівняльними характеристиками – при представленні результатів, наданні висновків та пропозицій.*

Результати*. Проведено факторний аналіз показників, які характеризують інноваційний розвиток держави за період 2010-2019 рр. За допомогою методу модифікованої основної складової побудовано узагальнюючий показник. Розрахунок узагальнених показників рівня інноваційного розвитку (LID) у 2010-2019 роках проводився за допомогою програмного забезпечення SPSS 21. Обгрунтовані практичні рекомендації можуть бути застосовані не лише в українському бізнес -просторі, а й у бізнесі країн, які обрали інноваційний розвиток.*

Наукова новизна*. Вперше був запропонований інтегральний показник-рівень інноваційного розвитку соціально-економічних систем (країн, регіонів).*

Висновки*. Розроблений метод обрахунку інтегрального показника рівня інноваційного розвитку на щаблі екзогенної системи управління інноваційним процесом дає змогу виявити стан і тенденції інноваційного розвитку України та регіонів і підприємств, зокрема, оскільки охоплює глибоку оцінку інституційно-соціального, економічного, наукового, інформаційно-освітнього та фінансового потенціалів-складових інноваційного розвитку. У подальшому планується застосувати до проведених розрахунків метод екстраполяції з метою отримання прогнозних значень інтегрованого показника.*

Ключові слова: *інноваційний розвиток, факторний аналіз, рівень інноваційного розвитку, оцінка, методика, уніфікований показник, потенціал.*

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