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Intellectual capital development and protection assessment for institutions of higher education in Eastern Ukraine

*Modern empirical research on intellectual capital (IC) is related to the establishment of the mutual influence between its components, as well as its impact on the performance of business entities. The **purpose** of the article is to compare the intellectual capital components and the interpretation of their dynamic influence on the IC development level of the institution of higher education (IHE) in the conditions of reduction of one of the IC components or a sharp drop in the volume of services rendered. **Methodology.** The development and protection investigation of the IC components provided a factor analysis (the main component method) of the key indicators of the IHE activity. Based on the normalized values of the input indicators and their weights, the integral index of development and protection for the IC components for a certain IHE was calculated based on the results of the factor load research. With the input parameters normalization, some of them could be zero, so in order to prevent the zero values of the integral index of development and protection of the individual component and the IC as a whole, normalized additive convolution was used for their calculations. To interpret their meanings, a scale was developed for assessing the different levels of the IC development and protection in the range from [-1 to 1].*

***Results.** Under evacuation conditions, with a significant reduction in activity and a drop in productivity, the actual state of client capital development and protection depended on the ability of the university to recover or not to lose students. The level of human capital protection was determined by the ability to increase its level quickly at the expense of external resources, and the level of innovative capital protection – with the ability to restore or maintain the indicators of innovation and scientific activity. The values of integral indicators of development and protection as for the IC components fluctuated within [-0.9, 1] and correspond to real tendencies in the activity of the IHE after their forced territorial movement. But among the IHEs there was simultaneously the same (either positive or negative) dynamics of integral indicators of human and innovative capital. A similar pattern is confirmed by studies in the activities of industrial companies and financial institutions.*

***Practical implications.** The proposed method for determining the IC development and protection level is universal and may take into account different indicator combinations depending on the management objectives of the IHE. In addition, due to the problem factors normalization including in the analysis of indicators with different units of measurement does not occur. As well as the use of relative indicators, it is possible to match their meaning for different scale of institutions activity. **Value / originality.** The method involves conducting a non-financial analysis of the IC components, and also is not based on subjective values of the indicators, which is typical for expert methods with a score scale.*

***Keywords:** innovative capital; human capital; client capital; capital development; capital reduction; capital renewal; factor analysis.*

Introduction. Negative processes in the Ukrainian economy are reflected in the activities of institutions of higher education (IHEs) as elements of the socio-economic system. The consequences of the demographic crisis and external migration were accompanied by socio-economic implications of external aggression that did not go beyond higher education. Proceeding the function of IHEs in the socio-economic system of the country, when assessing the intellectual capital (IC) development and protection it is expedient to take into account the possibility of reproducing their intellectual resources. In this regard, it is advisable to develop further methodological approaches to assessing the components of IHE intellectual capital.

The process of IC development and protection of institutions of higher education during the period of their activity renewal after moving from temporarily occupied territories of Ukraine was chosen as a research object. Given the need for such a move, it was accompanied by a complete loss and the need to restore the material and technical base, reducing by half the contingent of academic staff (AS) and students, as well as the loss of partially restorative intellectual resources (procedural guidelines of education processes, software products, information bases, image and business ties), etc.

The purpose of the article is to assess the components of the intellectual capital of a certain IHE and to compare it with others on the basis of determining the factors with a logical interpretation of their impact on the level of intellectual capital development and protection in the conditions of a sharp decline in productivity.

Literature review. Methodological approaches to assess the level of the IC development and protection were developed using the recommendations (Pedro Eu. Et al. (2018), the existing approaches to its assessment for

industrial enterprises (Kozhushko, O. (2011).) and the classification of the IC components according to Edvinsson (2009). In addition, taking into account that human capital serves as an integral part of the IC, the development of the aggregate indicator calculation used human development assessment (Tutova OV, (2015). The source of data collection for analysis was the reports of the rectors of the investigated institutions.

Goals and methodology of the article. As a result of the fact that the values of the input i -indicators of a certain (client, human and innovative without processing) component of the IC of a certain IHE could fluctuate at relatively large intervals and have different measure units, they were linearly normalized [Herv'e Abdi, 2010] within $[-1, 1]$ with the distribution between incentives (formula 1.1) and disincentives (formula 1.2):

$$\tilde{x}_{ia} = 2 \times \frac{x_{ia} - x_i^{min}}{x_i^{max} - x_i^{min}} - 1; \quad (1.1)$$

$$\tilde{x}_{ia} = 2 \times \frac{x_i^{max} - x_{ia}}{x_i^{max} - x_i^{min}} - 1; \quad (1.2)$$

where \tilde{x}_{ia} is the normalized value of the input i^{th} indicator for the observation period a ; x_{ia} - the base value of the input i^{th} indicator for the observation period a ; x_i^{max}, x_i^{min} respectively, the maximum and minimum value of the i^{th} indicator for all observation periods.

Next, using statistic software Statistica a factor analysis has been conducted by the method of the main components. According to its results, the input i -indicators are transformed into new iy -indicators with different factor loads for y -factors. Within the framework of a certain m -component of the IC on the basis of the maximum factor load for each iy -indicator, its weighting factor has been calculated (formula 2):

$$d_{iym} = \frac{f_{iym} \times Var_{iym}}{\sum f_{iym} \times Var_{iym}}; \quad (2)$$

where d_{iym} is the weighted coefficient of the input i^{th} indicator with the maximum value of the factor load that entered into the y -factor (the main component) of the IC m -component, $i = \overline{1, n}$, $\sum d_{iym} = 1$, where n is input i -indicators of IC m -component; f_{iy} - the maximum value of the factor load of the input i -indicator, which entered into the y -factor (the main component); Var_{iy} - fractions of the total variance of the y -factor (the main component), which grouped the input i -indicators of the IC m -component with factor loads bigger than 0.7 (with a strong correlation bond on the basis of Pearson).

The annual values of the development and protection integral indicator of a separate IC m -component of the IHE included the definition of indicators for the iy -indicators (for input i -indicators, grouped by y -factors with factor loads bigger than 0.7 (formulas 3.1-3.3):

$$d_{iyK} \times K_{i \text{ норм}}; \quad (3.1)$$

$$d_{iyL} \times L_{i \text{ норм}}; \quad (3.2)$$

$$d_{iyN} \times N_{i \text{ норм}}. \quad (3.3)$$

where $d_{iyK}, d_{iyL}, d_{iyN}$ are the weight of the iy -indicator of the client, human and innovative IC m -component accordingly, $i = \overline{1, n}$, where n is the number of i -indicators used to assess the IC m -component ($\sum d_{iy} = 1$); $K_{i \text{ норм}}, L_{i \text{ норм}}, N_{i \text{ норм}}$ - normalized values of input i -indicators of the client, human and innovative IC m -component respectively within $[-1, 1]$.

With the normalization of the input i -indicators, some of them got zero values; therefore, a normalized additive convolution was used to calculate them in order to prevent the zero values of the integral indicators of the i -indicators and, as a result, the integral index of development and protection of the individual m -component. Taking into account the above-mentioned, annual estimation of the integral index for a certain intellectual capital m -component of a certain IHE was carried out within $[-1.1]$ by formulas 4.1-4.3:

$$I_K = \sum_{i=1}^n d_{iyk} \times K_{i \text{ норм}}; \quad (4.1)$$

$$I_L = \sum_{i=1}^n d_{iyl} \times L_{i \text{ норм}}; \quad (4.2)$$

$$I_N = \sum_{i=1}^n d_{iyh} \times N_{i \text{ норм}}. \quad (4.3)$$

where I_K, I_L, I_N - respectively development and protection integral indicators of the client, human and innovative components of the IC for a certain period for a certain IHE.

For the comparative analysis of the IC development and protection level among the analyzed institutions, the IC integral indicators have been determined for the years of observation. According to the factor analysis results by the main components method, the integral indices of the client I_K , human I_L and the innovative I_N components of the IC for the years of observation separately for each IHE have been converted into new mz -indicators. For each mz -indicator (integral indicators I_K, I_L та I_N , grouped by z -components with factor loads bigger than 0.7) its weighting factor is calculated (formula 5):

$$d_{zm} = \frac{f_{zm} \times Var_{zm}}{\sum f_{zm} \times Var_{zm}}; \quad (5)$$

where d_{zm} - the weight of the integral indicator of the IC m -component with the maximum value of the factor load, which entered into the z -factor (the main component), where $m = \overline{1, 3}$ - index of the IC component ($\sum d_{zm} = 1$); f_{zm} - the maximum value of the integral indicator factor load of the IC m -component, which entered

into the z -factor (the main component); Var_{zm} is the fraction of the total dispersion of the z -factor (the main component), which grouped the integral indicators of the IC m -component with factor loads bigger than 0.7.

The calculation of the annual values of the integral indicator for each IHE provided the definition of indicators for the corresponding observation period (formulas 6.1–6.3):

$$d_{zK} \times I_K; \quad (6.1)$$

$$d_{zL} \times I_L; \quad (6.2)$$

$$d_{zN} \times I_N; \quad (6.3)$$

where d_{zK} , d_{zL} , d_{zN} – the weight factor of the mz -indicator or the integral indicator of the IC m -component respectively, ($\sum d_{zm} = 1$); I_K , I_L , I_N – integral indicators of the client, human and innovative IC m -component, respectively, for the observation period ($-1 \leq I_m \leq 1$).

Taking into account the annual values of the indicators according to the IC components, the annual assessment of its integral index for a certain IHE (I_{IK}) was carried out within the limits $[-1, 1]$ by the normalized additive convolution (formula 7):

$$I_{IK} = d_{zK} \times I_K + d_{zL} \times I_L + d_{zN} \times I_N = \sum d_{zm} \times I_m; \quad (7)$$

The range of integral indicator characteristic values of the development and protection of the IC as a whole and its components for a specific IHE is taken in accordance with the features of the normalization of input i -indicators within $[-1, 1]$ (Table 1).

Table 1

Value scale of IC integral indicator (component indicators) according to the development and protection levels during the observation period

Indicator values	Relative level of IC development and protection
-1.0	Critically weak or absent
-1.0 до -0.5	Critically weak
Від -0.5 до 0.0	Moderate weak (low)
0.0	Medium
Від 0.0 до 0.5	Satisfactory
Від 0.5 до 1.0	High
1.0	Maximum

The main material of the research. Against the backdrop of a competition between all IHEs and difficult working conditions for institutions moved from temporarily occupied territories, the latter have not only a decrease in rating sites, but also a decrease in the integral indicators in the TOP-200 Ukraine rating for 2013 and 2016 (Reitynh VNZ TOP-200 Ukraine). In 2016 out of 6 institutions included in the first thirty rating of 2013, only 2 institutions retained their relative positions, namely Donetsk National Technical University (DonNTU) and Vasyl' Stus Donetsk National University (Vasyl' Stus DonNU) (in QS World University Rankings by Subject 2016-2017 it takes place in group 700+). Luhansk Taras Shevchenko National University (T.Shevchenko LNU) and Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU) significantly worsened their rating positions.

As for Donetsk National Medical University and the V.I. Vernadsky Taurida National University, in addition to a significant deterioration in rating positions, they have a significant decline in the integral indicators. Similar negative tendencies are observed in other moved institutions of higher education.

Thus, the results of the rating comparison indicate that only the most powerful institutions with the status of national ones have been able to maintain their rating and competitive positions in the market of education services. The ratings data for 2013-2016 indicate that the quality index of academic staff was crucial for maintaining their rating positions. Thus, despite the reduction of the education quality index and the effectiveness of international activities because of the known reasons, the growth of the quality index of academic staff did not deteriorate significantly the integral indicator of the rating of the most powerful IHEs: Vasyl' Stus DonNU, DonNTU, V. Dahl EUNU in 2016. In general, the growth of this index is characteristic for 7 out of 12 institutions under the research. Thus, these facts may indicate the existence of the development and protection certain level in innovative and human capital as IC components among institutions moved from the occupied parts of Donetsk and Luhansk regions.

A more accurate assessment of the IC components protection was carried out for the four most powerful IHEs from the moved ones. Using the data from the rectors' reports of these institutions in three years, input groups were formed for the analysis of client, human and innovative capital. After the distribution of input i -indicators for incentives and disincentives, their values were the subject to linear normalization in the interval $[-1, 1]$ by formulas 1.1 and 1.2, the results of which are given in Table 2.

Table 2

Normalized input *i*-indicators for the studied groups and IHEs

Year s	Indicator symbols of client capital				Indicator symbols of human capital				Indicator symbols of innovative capital			
	$K_1\ norm$	$K_2\ norm$	$K_3\ norm$	$K_4\ norm$	$L_1\ norm$	$L_2\ norm$	$L_3\ norm$	$L_4\ norm$	$N_1\ norm$	$N_2\ norm$	$N_3\ norm$	$N_4\ norm$
Donetsk National Technical University (DonNTU)												
2013/ 2014	1	-1	1	1	-1	-1	-1	-1	1	-1	-1	1
2014/ 2015	-0.6559	-0.3120	0.7942	-1	-0.8421	0.4410	0.5503	-0.4106	-0.3793	-0.5695	0.3333	-1
2015/ 2016	-1	1	-1	-0.0906	1	1	1	1	-1	1	1	-0.7855
Vasyl' Stus Donetsk National University (Vasyl'Stus DonNU)												
2013/ 2014	0.8415	-1	-1	-0.22608	1	0.4432	0.7217	-1	1	1	-1	1
2014/ 2015	-1	-0.3099	0.6630	-1	1	1	1	1	-1	0.5434	-0.3333	-0.4018
2015/ 2016	1	1	1	1	-1	-1	-1	-0.0335	-0.9220	-1	1	-1
Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU)												
2013/ 2014	0.9236	1	1	-1	1	-1	-1	-1	0.4499	-1	-1	1
2014/ 2015	-1	0.2183	-0.3467	-0.7998	1	-0.5281	-0.2710	-0.9380	-1	0.1968	-0.6000	-1
2015/ 2016	1	-1	-1	1	-1	1	1	1	1	1	1	0.2277
Luhansk Taras Shevchenko National University (T.Shevchenko LNU)												
2013/ 2014	-0.4380	1	1	-1	1	-0.5198	0.1861	-1	-0.9355	-1	-1	-1
2014/ 2015	-1	-1	-0.3510	1	1	-1	-1	0.1345	1	1	1	0.3988
2015/ 2016	1	-0.2266	-1	0.7853	-1	1	1	1	-1	-0.8431	1	1

Using the factor analysis of the main components method, the input *i*-indicators were converted to the factor $y=1$ and the factor $y=2$ (Table 3). At the same time, for all institutions, the indicators of client capital immediately form the factors 1 and 2, except for the number of students per one full-time academic worker, which suggests the relative continuity of this ratio and the possibility of using it as a universal indicator in the assessment of client capital. On the other hand, the inclusion of indicators of human and innovative capital in one factor (component) in almost all cases requires certain studies as for the completeness and content of the relevant indicators in order to eliminate the possible one-sided analysis of the component development process.

Based on the normalized values of the inputs *i*-indicators (Table 2) and the results of the factor loadings research in Table 3 the weight of the *iy*-indicators is calculated (input *i*-indicators grouped by *y*-factors) by the formula 2. The calculation results of indicators for *iy*-indicators according to formulas 3.1–3.3 are presented respectively for client capital in Table 4, for human capital – in Table 5, for innovative capital – in Table 6.

Table 3

Research results of the *i*-indicator factor loads and determination of *iy*-indicators

Client capital indicators				Human capital indicators				Innovative capital indicators			
K_i	Factor 1	Factor 2	Weight factor	L_i	Factor 1	Factor 2	Weight factor	N_i	Factor 1	Factor 2	Weight factor
Donetsk National Technical University (DonNTU)											
K_1	-0,9706	-0,2405	0,2199	L_1	-0,8827		0,2390	N_1	0,9995		0,2443
K_2	0,9561	-0,2929	0,2894	L_2	0,8838		0,2394	N_2	-0,8768		0,2318
K_3	-0,8530	0,5218	0,2582	L_3	-0,9635		0,2608	N_3	-1,0000		0,2643

K_4	-0,6403	-0,7680	0,2325	L_4	-0,9639		0,2608	N_4	0,9058		0,2596
The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000
	0,7858	0,2514			0,8544	-			0,8971	-	
Vasyl' Stus Donetsk National University (Vasyl' Stus DonNU)											
K_1	-0,5695	0,8220	0,1807	L_1	-0,9974	-0,0718	0,3014	N_1	0,8985		0,2402
K_2	-0,9368	-0,3499	0,3251	L_2	-0,9798	0,1999	0,2960	N_2	0,9180		0,2454
K_3	-0,6215	-0,7834	0,1723	L_3	-0,9984	0,0570	0,3017	N_3	-0,9571		0,2559
K_4	-0,9276	0,3736	0,3219	L_4	0,1843	0,9829	0,1009	N_4	0,9668		0,2585
The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000
	0,6121	0,3879			0,7464	0,2536			0,8752		
Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU)											
K_1	0,2421	0,9702	0,1196	L_1	0,9880		0,2498	N_1	-0,6197	0,7848	0,1994
K_2	-0,9964	0,0854	0,3042	L_2	-0,9974		0,2522	N_2	-0,8718	-0,4850	0,2548
K_3	-0,9178	0,3971	0,2792	L_3	-0,9773		0,2421	N_3	-0,9979	-0,0654	0,2916
K_4	0,9755	0,2200	0,2970	L_4	-0,9918		0,2559	N_4	-0,0060	0,9999	0,2542
The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000
	0,7113	0,2887			0,9775	-			0,5349	0,4651	
Luhansk Taras Shevchenko National University (T. Shevchenko LNU)											
K_1	0,2976	-0,9547	0,0759	L_1	0,9959		0,2756	N_1	-0,8179	-	0,2472
K_2	-0,9013	-0,4332	0,2765	L_2	-0,9900		0,2739	N_2	-0,8708	-	0,2632
K_3	-0,9640	0,2659	0,2958	L_3	-0,8575		0,2373	N_3	-0,8949	-	0,2705
K_4	0,9884	0,1518	0,3518	L_4	-0,7704		0,2132	N_4	-0,7249	-	0,2191
The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000	The share of total dispersion Var_{iy}			1.0000
	0,7018	0,2982			0,8252	-			0,6884	-	

According to the formula 4.1 in Table 4, the calculation of client capital integral indicators was performed for the universities under research.

Table 4
Indicator calculations for iy-indicators and integral indicator of client capital development and protection

IHE	Years	Integral indicator				Integral indicator of client capital development and protection
		K_1	K_2	K_3	K_4	
Luhansk Taras Shevchenko National University (T. Shevchenko LNU)	2013/2014	-0,0332	0,2765	0,2958	-0,3518	0,1873
	2014/2015	-0,0759	-0,2765	-0,1038	0,3518	-0,1044
	2015/2016	0,0759	-0,0627	-0,2958	0,2763	-0,0063
Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU)	2013/2014	0,1105	0,3042	0,2792	-0,297	0,3969
	2014/2015	-0,1196	0,0664	-0,0968	-0,2375	-0,3875
	2015/2016	0,1196	-0,3042	-0,2792	0,297	-0,1668
Vasyl' Stus Donetsk National University (Vasyl' Stus DonNU)	2013/2014	0,1521	-0,3251	-0,1723	-0,0727	-0,4181
	2014/2015	-0,1807	-0,1007	0,1142	-0,3219	-0,4891
	2015/2016	0,1807	0,3251	0,1723	0,3219	1,0000
Donetsk National Technical University (DonNTU)	2013/2014	0,2199	-0,2894	0,2582	0,2325	0,4212
	2014/2015	-0,1442	-0,0903	0,2051	-0,2325	-0,2620
	2015/2016	-0,2199	0,2894	-0,2582	-0,0211	-0,2098

According to the formula 4.2 in Table 5, the calculation of human capital integral indicators for the researched universities was also carried out.

Table 5

Indicator calculations for i_y -indicators and integral indicator of human capital development and protection

IHE	Years	Integral indicator				Integral indicator of human capital development and protection
		L_1	L_2	L_3	L_4	
Luhansk Taras Shevchenko National University (T.Shevchenko LNU)	2013/2014	0,2756	-0,1423	0,2165	-0,2132	0,1365
	2014/2015	0,2756	-0,2739	0,2166	0,02868	0,2470
	2015/2016	-0,2756	0,2739	0,2167	0,2132	0,4282
Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU)	2013/2014	0,2498	-0,2522	0,2168	-0,2559	-0,0415
	2014/2015	0,2498	-0,133187	0,2169	-0,240034	0,0935
	2015/2016	-0,2498	0,2522	0,217	0,2559	0,4753
Vasyl' Stus Donetsk National University (Vasyl'Stus DonNU)	2013/2014	0,3014	0,1311783	0,2171	-0,1009	0,5488
	2014/2015	0,3014	0,296	0,2521	0,1009	0,9504
	2015/2016	-0,3014	-0,296	-0,3017	-0,0034	-0,9025
Donetsk National Technical University (DonNTU)	2013/2014	-0,2390	-0,2394	-0,2608	-0,2608	-1,0000
	2014/2015	-0,2013	0,1056	0,1435	-0,1071	-0,0593
	2015/2016	0,2390	0,2394	0,2608	0,2608	1,0000

According to the formula 4.3 in Table 6, the calculation of innovative capital integral indicators for the researched universities was also performed.

Table 6

Indicator calculations for i_y -indicators and integral indicator of innovative capital development and protection

IHE	Years	Integral indicator				Integral indicator of innovative capital development and protection
		N_1	N_2	N_3	N_4	
Luhansk Taras Shevchenko National University (T.Shevchenko LNU)	2013/2014	-0,2313	-0,2632	-0,2705	-0,2191	-0,9841
	2014/2015	0,2472	0,2632	0,2705	0,0873	0,8683
	2015/2016	-0,2472	-0,2219	0,2705	0,2191	0,0205
Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU)	2013/2014	0,0897	-0,2548	-0,2916	0,2542	-0,2025
	2014/2015	-0,1994	0,0501	-0,1749	-0,2542	-0,5784
	2015/2016	0,1994	0,2548	0,2916	0,0578	0,80367
Vasyl' Stus Donetsk National University (Vasyl'Stus DonNU)	2013/2014	0,2402	0,2454	-0,256	0,2585	0,4882
	2014/2015	-0,2402	0,1333	-0,0853	-0,1039	-0,2960
	2015/2016	-0,2214	-0,2454	0,2559	-0,2585	-0,4694
Donetsk National Technical University (DonNTU)	2013/2014	0,2443	-0,2318	-0,2643	0,2596	0,0078
	2014/2015	-0,0927	-0,1320	0,0881	-0,2596	-0,3962
	2015/2016	-0,2443	0,2318	0,2643	-0,2039	0,0479

The study of the IC development and protection level was continued by conducting a factor analysis of the integral indicators of IC components for each institution. For integral indicators I_K , I_L and I_N after grouping according to z -components, their weight coefficients (formula 5) and corresponding indicators (formula 6.1–6.3) were calculated. Taking into account the values of the latter through the additive convolution, the integral indicator values of the IC as a whole for a certain IHE (I_{IK}) were obtained (Table 7).

Table 7

Factor analysis results of integral indicators of IC components and integral indicator calculations of IC development and protection of a certain IHE

Integral indicators of the IC components (I_m) over the years				z- components (factors)		Weight factor d_{zm}	Years	Indicators $d_{zm} \times I_m$			IC integral indicator, I_{IK}
2013-2014	2014-2015	2015-2016		Factor 1	Factor 2			$d_{zK} \times I_K$	$d_{zL} \times I_L$	$d_{zN} \times I_N$	
Donetsk National Technical University (DonNTU)											
I_K	0,4212	-0,2620	-0,2098	0,9981	-0,0611	0,3638	2013-2014	0,1532	-0,3079	0,0026	-0,1521
I_L	-1,0000	-0,0593	1,0000	-0,8444	-0,5358	0,3079	2014-2015	-0,0953	-0,0183	-0,1300	-0,2436
I_N	0,0078	-0,3962	0,0479	0,4344	-0,9007	0,3283	2015-2016	-0,0763	0,3079	0,0157	0,2473
The share of total dispersion Var_{zm}				0,6327	0,3673	1,0000	-				
Vasyl' Stus Donetsk National University (Vasyl'Stus DonNU)											
I_K	-0,4181	-0,4891	1,0000	-0,9835	-	0,3692	2013-2014	-0,15436	0,193672	0,135671	0,1750
I_L	0,5488	0,9504	-0,9025	0,9404	-	0,3529	2014-2015	-0,18058	0,335396	-0,08226	0,0726
I_N	0,4882	-0,2960	-0,4694	0,7405	-	0,2779	2015-2016	0,3692	-0,31849	-0,13045	-0,0797
The share of total dispersion Var_{zm}				0,8000	-	1,000	-				
Volodymyr Dahl East Ukrainian National University (V. Dahl EUNU)											
I_K	0,3969	-0,3875	-0,1668	0,4721	0,8815	0,3201	2013-2014	0,1271	-0,0151	-0,0642	0,0478
I_L	-0,0415	0,0935	0,4753	-0,9999	-0,0102	0,3631	2014-2015	-0,1240	0,0340	-0,1832	-0,2733
I_N	-0,2025	-0,5784	0,80367	-0,8725	0,4887	0,3168	2015-2016	-0,0534	0,1726	0,2546	0,3738
The share of total dispersion Var_{zm}				0,6613	0,3387	1,000	-				
Luhansk Taras Shevchenko National University (T.Shevchenko LNU)											
I_K	0,1873	-0,1044	-0,0063	0,9561	-0,2929	0,2894	2013-2014	0,0699	0,0364	-0,3539	-0,2476
I_L	0,1365	0,2470	0,4282	-0,8530	0,5218	0,2582	2014-2015	0,269	0,0659	0,3123	0,6473
I_N	-0,9841	0,8683	0,0205	-0,6403	-0,7680	0,2325	2015-2016	-0,0024	0,1142	0,0074	0,1193
The share of total dispersion Var_{zm}				0,7858	0,2514	1,000	-				

Findings. The dynamics handling of the integral indicators of IC development and protection over the years has been confirmed by the real tendencies in the activity of the IHEs after their forced territorial movement. At the end of the observation period, the level of client capital protection had a positive dynamics only for Vasyl'Stus DonNU. It was negative for all other universities. At the same time, the level of client capital development and protection can be characterized as moderate weak (low), which showed the appropriate ability to restore or not to lose the contingent of students.

The opposite situation has developed with the level of human capital development and protection. At the end of the analyzed period, in all universities, except Vasyl' Stus DonNU, the maximum (in DonNTU) and satisfactory level is marked. This situation is explained by significant losses of human capital in Vasyl' Stus DonNU and lack of sufficient resources for its relatively quick recovery. So, unlike Vasyl' Stus DonNU, the maximum value of this indicator in DonNTU was ensured, despite substantial losses of human resources in 2014, by an increase in human capital at the expense of human resources of their affiliates (colleges).

The protection level of innovative capital reflects the ability of institutions to restore or maintain the indicators of innovative and scientific activity. At the end of the observation period it was: high for the V. Dahl EUNU – due to the development and training of full-time academic staff (the number of defended works for obtaining a scientific degree, the number of internships abroad and the number of patents (copyrights) per one full-time academic worker); satisfactory for DonNTU and T.Shevchenko LNU. A relative decline in innovative activity indicators at Vasyl' Stus DonNU determined the corresponding deterioration of the integral indicator along with the modestly weak level of innovation capital development and protection.

Thus, at the end of the period 2013-2016, the three universities that ranked the best positions in TOP-200 Ukraine ranking (DonNTU, Vasyl' Stus DonNU, V. Dahl EUNU) had various levels of development and protection of different IC components over the years. But 2-3 years later, after the forced territorial movement and renewal of work in force majeure, these three universities managed to build noticeably at least one of the IC components. This is evidenced by the significance at the level 1.0 of the human capital integral indicator in

DonNTU and the client capital integral indicator at Vasyly'stus DonNU, as well as at the level of 0.8 innovative capital integral indicator at V. Dahl EUNU.

Despite the sharp fluctuation of the integral values of the IC components from -0.9 to 1.0, each university has the same character of development of the human and innovative intellectual capital component. Thus, the development nature of human and innovative capital in all IHEs was simultaneously positive or at the same time negative. A similar pattern is confirmed by studies in the activities of industrial companies (Andreeva & Garanina, 2017) and financial institutions (Ayub et al., 2017).

Conclusion. The proposed method for determining the dynamics of development and protection of the IC and its components is universal and may take into account various combinations of key and additional indicators, including a balanced system of indicators (Breus S. & Khaustova Ye. 2016). The results of its use can become the basis for the development and forecasting of the measures to build individual IC components as public and private education institutions. It makes it possible to have comparative analysis of indicators of either one institution in dynamics, or group of institutions. The scientific novelty of the method lies in the possibility of conducting a non-financial analysis of the IC and its components within budget institutions or non-profit organizations, as well as eliminating the subjectivity of the results, which is typical for expert methods with the score scale (Kozhushko, 2016). The expediency of using the possibilities of the factor method to construct a model for the IC development of the institution of higher education is the subject of further research.

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