

STAFFING FOR THE INNOVATIVE-INTEGRATED STRUCTURES

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Storozhuk O. V., Zaiarniuk O. V. Staffing for the Innovative-Integrated Structures

The article is aimed at studying the status of staffing for the innovative-integrated structures of the regions of Ukraine. On calculating the coefficients that characterize the components of the indicator for assessment of the staffing for innovative development, it has been concluded that the level of staffing for the innovative-integrated structures of the regions of Ukraine is low and thus brings evidence about that science-technological and innovation activities are in a threatening and, in some regions, in crisis state. The article builds the regional ranking, based on a number of indicators that reflect asymmetry in the staffing of innovative-integrated structures at the region level. It has been substantiated that the results of such ranking can serve as a basis for the development of regional strategic documents. Prospect for further research in this direction is conducting a study on the staffing for development of the potential innovative-integrated regional structures in terms of the areas of science.

Keywords: staffing, innovative-integrated structures, region.

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Storozhuk Oksana V. – PhD (Economics), Associate Professor of the Department of Economics, Management and Commercial Activities, Central Ukrainian National Technical University (8 Universytetskyi Ave., Kropivnitskyi, 25006, Ukraine)

E-mail: oksana_storozhuk@ukr.net

Zaiarniuk Oleksii V. – PhD (Economics), Associate Professor of the Department of Economics, Management and Commercial Activities, Central Ukrainian National Technical University (8 Universytetskyi Ave., Kropivnitskyi, 25006, Ukraine)

E-mail: oleksiyzajarnuk@meta.ua

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Сторожук О. В., Заярнюк О. В. Кадрове забезпечення інноваційно-інтегрованих структур

Мета статті полягає в дослідженні стану кадрового забезпечення інноваційно-інтегрованих структур регіонів України. На підставі розрахунку коефіцієнтів, що характеризують складові показники оцінки кадрового забезпечення інноваційного розвитку, зроблено висновок, що рівень кадрового забезпечення інноваційно-інтегрованих структур регіонів України є низьким і свідчить про те, що науково-технічна та інноваційна діяльність знаходиться у загрозовому стані, а в окремих регіонах – у кризовому. Побудовано рейтинг регіонів за низкою показників, що відображають асиметричність в кадровому забезпеченні інноваційно-інтегрованих структур на регіональному рівні. Обґрунтовано, що результати такого ранжування можуть служити основою розроблення регіональних стратегічних документів. Перспективою подальших досліджень у даному напрямі є проведення дослідження кадрового забезпечення формування потенційних інноваційно-інтегрованих структур регіонів у розрізі галузей науки.

Ключові слова: кадрове забезпечення, інноваційно-інтегровані структури, регіон.

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Сторожук Оксана Василівна – кандидат економічних наук, доцент кафедри економіки, менеджменту та комерційної діяльності, Центральноукраїнський національний технічний університет (пр. Університетський, 8, Кропивницький, 25006, Україна)

E-mail: oksana_storozhuk@ukr.net

Заярнюк Олексій Васильович – кандидат економічних наук, доцент кафедри економіки, менеджменту та комерційної діяльності, Центральноукраїнський національний технічний університет (пр. Університетський, 8, Кропивницький, 25006, Україна)

E-mail: oleksiyzajarnuk@meta.ua

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Сторожук О. В., Заярнюк А. В. Кадровое обеспечение инновационно-интегрированных структур

Цель статьи заключается в исследовании состояния кадрового обеспечения инновационно-интегрированных структур регионов Украины. На основании расчета коэффициентов, характеризующих составляющие показателя оценки кадрового обеспечения инновационного развития, сделан вывод, что уровень кадрового обеспечения инновационно-интегрированных структур регионов Украины является низким и свидетельствует о том, что научно-техническая и инновационная деятельность находится в угрожающем состоянии, а в отдельных регионах – в кризисном. Построен рейтинг регионов по ряду показателей, отражающих асимметричность в кадровом обеспечении инновационно-интегрированных структур на региональном уровне. Обосновано, что результаты такого ранжирования могут служить основой разработки региональных стратегических документов. Перспективой дальнейших исследований в данном направлении является проведение исследования кадрового обеспечения формирования потенциальных инновационно-интегрированных структур регионов в разрезе отраслей науки.

Ключевые слова: кадровое обеспечение, инновационно-интегрированные структуры, регион.

Табл.: 2. **Библ.:** 16.

Сторожук Оксана Васильевна – кандидат экономических наук, доцент кафедры экономики, менеджмента и коммерческой деятельности, Центральноукраинский национальный технический университет (пр. Университетский, 8, Кропивницкий, 25006, Украина)

E-mail: oksana_storozhuk@ukr.net

Заярнюк Алексей Васильевич – кандидат экономических наук, доцент кафедры экономики, менеджмента и коммерческой деятельности, Центральноукраинский национальный технический университет (пр. Университетский, 8, Кропивницкий, 25006, Украина)

E-mail: oleksiyzajarnuk@meta.ua

Under conditions of global changes, Ukraine's integration into the European economic space and fast expansion of innovations, continuous improvement of the regional competitiveness is possible due to external factors of the institutional level: public and private partnership; development of social capital; increase of synergy effect; cooperation of the state with business, science and

education; expansion of integration processes and formation of innovation integrated structures.

At present, the necessity of development of theoretical concepts that allow substantiating and realizing effective forms of territorial organization of the economy and competitive strategies of social and economic development of regions is growing. The spread of integration tendencies is

a relatively new approach to the territorial organization of the economic system, which allows increasing labour productivity and efficiency of production, reducing transaction costs and stimulating innovations. By “innovation integrated structure” we mean a set of compactly located industrial enterprises, research organizations, higher education institutions, individual entrepreneurs, government agencies, public organizations with a common technological and scientific base, logistics and infrastructure chains. Their mutually beneficial activity is based, above all, on the benefits of the simultaneous operation of various market mechanisms that produce and disseminate new knowledge, technology and innovation quickly and efficiently.

The problems of development of innovation integrated structures (IISs) were studied by well-known domestic scientists, namely Buryak P. Yu., Bohma O. S., Voynarenko M. P., Hanuschak L. M., Semenov H. A., Sokolenko S. I., Fedotova Yu. V., Fedulova L. I., Pulina T. V., Chevhanova V. Ya., Cherep A. V. [1; 2; 3; 6; 7; 12–15]. The authors consider various effective ways of combining interests of industrial enterprises and scientific institutions and organizations. However, the problems of staffing as one of the most important areas for improving functioning of IISs are not given sufficient attention.

The *aim* of the article is to study the issue of staffing of IISs in the regional context, examine its development problems, assess the current situation and elaborate proposals for its improvement.

Modernization of all spheres of social life is an essential prerequisite for further development of the Ukrainian economy. The social and economic development of the country and its regions is determined by many factors. The depth and extent of the activities of innovation integrated structures have increased recently with the growth of globalization processes, intensification of competition, and complication of the situation on the world market. The research conducted by Ukrainian scientists reveals the following key factors that hinder the development of initiatives on creation of innovation integrated structures, which include indifference to innovation; low level of public activity; human capital degradation; lack of a unified method to form an IIS depending on the social and economic features of administrative and territorial units on which territory they will function; lack of necessary regulatory acts regarding the regulation of the creation and operation of IISs; absence of development programmes for various spheres of the national economy, which would determine the possibility to apply mechanisms of public and private partnership in the form of IIS.

According to the rankings of international economic organizations, Ukraine holds one of the last places in terms of competitiveness. Thus, according to the global competition index published by the World Economic Forum [11], in 2017 Ukraine ranked 85th out of 138 possible places (in 2016 it ranked 79th). Among the worst indicators are property rights protection (131), protection of minority shareholders (136), road quality (134), inflation (136), antimonopoly policy (136), effect of taxes on investments (133), customs (130), influence of rules on foreign investments (130), sol-

vency of banks (138), stock market regulation (137), fast Internet connection (130).

Taking into account these indicators experts have classified Ukraine to the group of countries moving from the first stage (the factor-driven economy oriented towards the creation of production potential) to the second stage (the efficiency-driven economy aimed at increasing efficiency). As for the third stage – the innovation-driven economy oriented towards innovations – it is still difficult to talk about it regarding our country.

In the meantime, IIS mechanisms for increasing the innovation potential of the industry are actively used by many developed countries of the world [16]. Thus, the main advantages of an IIS are: strengthening cooperation between business, science and the state; increasing the efficiency of companies' operation through a more direct access to resources, knowledge, innovation technologies and suppliers, as well as reduction of transaction costs; intensifying innovation activity of companies. Due to the so-called spill-over effect and closer contact with consumers and other companies, there are opportunities for creating and disseminating new ideas and technologies among the participants of an IIS and beyond it, which contributes to, first of all, increasing the added value of products and orientation of the production to high-tech final consumption products; raising the level of investment attractiveness of regions and the country as a whole due to a higher level of investor confidence in the developed network structures (compared to individual small companies), as well as the provision of guarantees and benefits for investors by the state in the case of its participation in an IIS; accelerating the pace of creation and development of a new business. New companies have the opportunity to develop under more favourable conditions through establishment of links with their partners within an IIS; formation of a closed production cycle (value chain) within the country due to creating in IISs the links that were previously absent in the production, which is directly related to development of import substitution and economic growth in general at the regional and national levels.

Despite the obvious advantages of IIS, the most common problems that hinder their development include infrastructure, financial, research and educational support, and staffing.

A particularly important issue in the context of development of regional marketing and intensification of inter-regional competition is studying the staffing of development of innovation integrated structures, since of all innovation resources it is the human resource that is gaining an utmost importance today. Organization and implementation of innovation activities, establishment of the balance of quantity and quality of resources entirely depend on human capabilities. The quality of human resources is determined by the size of human capital, which becomes a leading factor in the innovation development of the economy. Knowledge becomes crucial and turns into a source of wealth which can be accumulated and applied as the main factor in the innovation development and competitiveness of the country and its regions.

The indicators we have selected, in our opinion, most clearly show the state of the staffing of development of IISs in regions of Ukraine.

To carry out the analysis of this kind we take into consideration relative indicators, which include the following coefficients that characterize the components of the indicator for evaluating the staffing of innovation development of the region ($K_1 \dots K_7$).

K_1 = "the total number of students of higher education institutions of III and IV accreditation level, postgraduate students and doctoral students in the region for the analyzed period", persons / "the total number of economically active population of the region for the corresponding period", persons. This coefficient characterizes the level of tertiary education of the population in the region and is a quantitative indicator for evaluating the available staffing of an IIS.

K_2 = "the number of employees of scientific organizations in the region for the analyzed period", persons / "the total number of economically active population in the region for the corresponding period", persons. The coefficient K_2 characterizes the number of staff engaged in research and development. It is a quantitative indicator for evaluating the available staffing of an IIS.

K_3 = "the amount of financing of expenses on the performance of scientific and technical work in the region for the analyzed period", thousands of UAH / "the number of employees of scientific organizations in the region for the corresponding period", persons. This coefficient characterizes the level of regional expenses on the carrying out of

scientific work. It is a quantitative indicator that characterizes interregional differences in the financing of scientific developments.

K_4 = "the number of the performed scientific and technical works", items / number of employees of scientific organizations for the corresponding period", persons. The coefficient K_4 characterizes the productivity of employees of scientific organizations in the region and is a qualitative indicator for evaluating the available staffing of an IIS.

K_5 = "the amount of financing of expenses on the performance of scientific and technical work" / "the number of scientific and technical works performed". This coefficient characterizes the indicator for evaluating the amount of funding per scientific work performed by scientific organizations in the region.

K_6 = "the number of the implemented scientific and technical works", items / "the number of employees of scientific organizations", persons. This coefficient characterizes the efficiency of using the existing personnel potential by the number of the implemented scientific and technical works.

K_7 = "the volume of the realized innovative products", thousands of UAH / "the volume of the gross regional product", thousands of UAH. This coefficient characterizes the share of innovative products in the gross regional product and is a qualitative indicator for evaluating the available staffing of an IIS in the region.

The results of calculating the indicators of the staffing of innovation integrated structures for regions of Ukraine by the coefficients we chose are given in *Tbl. 1*.

Table 1

The results of calculating the indicators of staffing of innovation integrated structures by regions of Ukraine

Region	K_1	K_2	K_3	K_4	K_5	K_6	K_7
1	2	3	4	5	6	7	8
Vinnitsia	0.0475	0.0007	68.8626	0.6364	108.2127	0.3388	0.0151
Volyn	0.0456	0.0004	94.4133	0.8989	105.0278	0.2500	0.0131
Dnipropetrovsk	0.0661	0.0062	149.8954	0.2098	714.4396	0.1601	0.0089
Donetsk	0.0290	0.0024	79.4339	0.2113	375.8579	0.0792	0.0085
Zhytomyr	0.0374	0.0005	73.5064	0.5376	136.7322	0.3083	0.0086
Zakarpattia	0.0355	0.0011	65.5629	0.2091	313.5837	0.0373	0.0347
Zaporizhzhya	0.0773	0.0051	123.5371	0.2072	596.2191	0.1354	0.0232
Ivano-Frankivsk	0.0519	0.0007	104.5000	0.9950	105.0225	0.3507	0.0235
Kyiv	0.0301	0.0028	98.3909	0.2865	343.4310	0.1696	0.0113
Kirovohrad	0.0227	0.0010	134.5104	4.4195	30.4357	4.2426	0.0175
Luhansk	0.0450	0.0009	90.5944	1.0815	83.7670	0.8589	0.0012
Lviv	0.0999	0.0038	70.8532	0.4787	148.0090	0.2616	0.0100
Mykolaiv	0.0480	0.0040	140.8330	0.2346	600.2360	0.1329	0.0103
Odesa	0.0939	0.0029	82.3056	0.6184	133.0954	0.4896	0.0093
Poltava	0.0649	0.0015	59.5431	0.8328	71.4968	0.5983	0.0934
Rivne	0.0537	0.0004	59.1668	0.4947	119.5926	0.3105	0.0047
Sumy	0.0623	0.0034	71.3456	0.6657	107.1672	0.4520	0.0859
Ternopil	0.0761	0.0005	50.2986	0.7647	65.7751	0.4615	0.0062
Kharkiv	0.1239	0.0130	121.0412	0.4327	279.7669	0.3361	0.0270
Kherson	0.0424	0.0012	62.0429	0.3240	191.4656	0.1585	0.0283

1	2	3	4	5	6	7	8
Khmelnyskyi	0.0495	0.0003	90.1331	0.5143	175.2589	0.2971	0.0051
Cherkasy	0.0536	0.0015	117.0132	0.2664	439.3039	0.2400	0.0145
Chernivtsi	0.0563	0.0013	84.7859	0.4624	183.3663	0.1651	0.0054
Chernihiv	0.0348	0.0014	78.3307	1.2286	63.7575	0.0391	0.0054
City of Kyiv	0.2511	0.0329	129.7769	0.3736	347.4060	0.2727	0.0049

Source: developed by the authors based on [4; 5; 8].

Equally important for the staffing of innovation integrated structures is the use of the human resources available in the economy in the narrow sense, as well as the use of the human resources available within the limits of an IIS. Therefore, in order to evaluate the staffing of available or potentially possible innovation integrated structures, we take the simplest model of the sum of places which involves summing the points for all components.

$A = a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + a_7$ is the ranking of the regions of Ukraine (the sum of the values of indicators): the minimum value A corresponds to the highest ranking of the region, the maximum is the lowest one (Tbl. 2).

According to the received results (see Tbl. 2), by the ranking of the staffing of innovation integrated structures in the regional aspect, the 1st place is held by Kharkiv region (49 points), the 2nd place with 16 points is held by the city of Kyiv. The top ten leading regions include Sumy region (68 points), Dnipropetrovsk region (70 points), Zaporizhzhya region (70 points), Odesa region (70 points), Poltava region (74 points), Ivano-Frankivsk region (78 points), Kirovohrad region (80 points), Mykolaiv region (80 points). Ternopil, Kherson, Khmelnytskyi, Zhytomyr, Donetsk, Zakarpattya, Rivne and Chernihiv regions are at the end of the list (with the criterion value from 107 to 122 points).

Table 2

The ranking of the indicators of innovation integrated structures staffing by regions of Ukraine

Region	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	a ₇	A
Kharkiv	2	2	6	16	9	9	5	49
City of Kyiv	1	1	4	17	6	13	23	65
Sumy	9	7	18	8	18	6	2	68
Dnipropetrovsk	7	3	1	23	1	19	16	70
Zaporizhzhya	5	4	5	25	3	21	7	70
Odesa	4	8	14	10	15	4	15	70
Poltava	8	11	23	6	22	3	1	74
Ivano-Frankivsk	13	20	8	4	20	7	6	78
Kirovohrad	25	17	3	1	25	1	8	80
Mykolaiv	15	5	2	21	2	22	13	80
Cherkasy	12	12	7	20	4	16	10	81
Lviv	3	6	19	14	13	14	14	83
Kyiv	23	9	9	19	7	17	12	96
Vinnytsia	16	19	20	9	17	8	9	98
Luhansk	18	18	11	3	21	2	25	98
Volyn	17	23	10	5	19	15	11	100
Chernivtsi	10	14	13	15	11	18	20	101
Ternopil	6	22	25	7	23	5	19	107
Kherson	19	15	22	18	10	20	4	108
Khmelnyskyi	14	25	12	12	12	12	22	109
Zhytomyr	20	21	17	11	14	11	17	111
Donetsk	24	10	15	22	5	23	18	117
Zakarpattya	21	16	21	24	8	25	3	118
Rivne	11	24	24	13	16	10	24	122
Chernihiv	22	13	16	2	24	24	21	122

Source: developed by the authors.

The data obtained reveal certain features related to the staffing of IISs by regional differentiation.

Thus, the city of Kiev by indicators a_1 and a_2 holds the leading position (ranks 1st), by indicator a_3 takes the 4th position among 25 regions, by indicator a_5 – the 6th position, by the indicator K_7 it ranks 23rd. This means that the staffing of the IIS of this region is characterized by:

- ✦ high level of tertiary education of the population in the region;
- ✦ high density of representatives of scientific activity in relation to the number of economically active population in the region;
- ✦ high level of expenses on performing scientific work;
- ✦ significant amount of funding per performed scientific work;
- ✦ medium efficiency of using the available staff potential by the number of performed scientific and technical works;
- ✦ medium level of labour productivity of employees at scientific organizations in the region;
- ✦ low specific weight of the realized innovative products in the gross regional product.

At the same time, Kirovohrad region, holding the last place in terms of tertiary education of the population in the region, has the 1st place in terms of the number of performed scientific and technical works per scientist.

We consider it appropriate to note that the regions that have significant scientific and technical potential (Kyiv, Kharkiv, Donetsk, Dnipro, Zaporizhzhya, Odesa, Lviv regions) implement it to a lesser extent. With regard to the regions that are the last in the ranking, it can be stated with confidence that the situation with the staffing of innovation development is critical. The consequence of such a state of the cognitive component in Ternopil, Kherson, Khmelnytskyi, Zhytomyr, Donetsk, Zakarpattia, Rivne and Chernihiv regions may be a complete violation of the innovation space, which cannot but negatively affects the state and development of the country's economy as a whole, depriving the country of competitiveness prospects on the world market.

Thus, studying the specifics of the regions in terms of the staffing of the functioning IISs in Ukraine's regions, as well as considering the preconditions and factors for the emergence of new IISs, will enable designing the interregional innovation integrated structures within the territory of the entire country on the basis of the principles of the most effective division of labor in innovation activities.

Using the calculation results in Table 1, it can be stated that if the region has the coefficient of the number of staff engaged in research and development is high (K_2), but the low level of realized innovative products (K_7), such as in Dnipropetrovsk, Donetsk, Kiev, Lviv regions and in the city of Kyiv, then it is necessary to develop management of innovation activity. In the opposite situation (Kirovohrad, Vinnytsia, Kherson regions), it is necessary to stimulate the development of the human resources potential of science and innovation as a generator of innovative ideas.

If in a particular region the scientific activity is carried out effectively, and in the other region it is innovation, then it is necessary to design the innovation system and organizational and economic mechanisms in such a way as to maximally integrate these components of different regions into a single IIS. In this case, for each region it is necessary to develop individual mechanisms and optimal parameters of innovation and economic processes.

Let us consider the key measures for the development of the staffing of an IIS in a region depending on the evaluation results.

At this stage of development, the basis of the state policy of Ukraine in the field of the staffing of IISs should be the work on implementation of initiatives proclaimed at the legislative level [10].

The main element of such a policy should be increasing the effectiveness of cooperation in the system "region-education-science-production", which requires the following:

- ✦ regional centres of scientific support of industrial production should carry out the advertising and demonstration of advanced R&D, which will promote the introduction of such developments in the production activity of IISs;
- ✦ regional and district state administrations, based on orders of participants of IISs, should formulate orders to higher educational and vocational institutions of Ukraine to train specialists of the required profile with their future employment in a respective IIS.

A separate important issue should be providing support for the development of IISs at the regional level. For this purpose the regional and district state administrations need:

- ✦ provide organizational and economic support for initiatives of enterprises and organizations as to forming IISs by means of developing the social and industrial infrastructure of the region in which the IISs function, creating comfortable conditions for the living and recreation of employees;
- ✦ develop web sites and a single information base with information on the IISs existing in the regions, inform entrepreneurs about benefits of this model of production organization during business development activities, create electronic forms of applications for enterprises wishing to become members of IISs, which would eliminate the information vacuum for potential investors and contribute to the attraction of national and foreign capital to IISs.

While developing strategies for the development of regions, it is necessary to provide measures aimed at development of the human resources component of the scientific, educational and innovative spheres. In order to optimize the use of financial, human and other resources, it is necessary to focus on solving the problems that have the greatest impact on the research and innovation, and socio-economic development of a region through IIS mechanisms.

For example, the analysis of the Development Strategy of Kirovohrad region for the period up to 2020 and the Plan of Actions for 2015–2017 on implementation of the Development Strategy of Kirovohrad region for the period up to 2020

[9] showed the following: with regard to capital of scientific and innovative creativity as well as intellectual and educational capital, the regional strategy is not clearly defined, the role of the region in the formation of initiatives on creation of innovation integrated structures is weak. Taking into account the above-mentioned considerations, it is necessary to develop a system of objectives for strengthening the staffing of innovation development of Kirovohrad region.

Most vital and necessary in the innovation development of Kirovohrad region is the development of capital of scientific and innovative creativity, which involves

- ✦ determination and support of priority directions of innovation activity at the regional and local levels;
- ✦ production of intellectual property for the innovation development of the region's economy;
- ✦ financial support for the implementation of innovative projects.

In addition, in order to improve the staffing of development of IISs, the growth of intellectual and educational capital is necessary, which implies:

- ✦ development of specific professional retraining, advanced training in organizations, at workplace;
- ✦ elimination of imbalances in the educational system in accordance with the needs of the labour market, etc.

This, in its turn, will eliminate disproportions in the social and economic development of the regions and promote development of interregional links through provision of state support for the creation and development of regional and interregional IISs in the sectors with the highest potential for production of goods competitive in the national and foreign markets.

CONCLUSIONS

The level of the staffing of innovation integrated structures in regions of Ukraine is low and shows that scientific, technological and innovation activity is in critical condition, and in some regions it is in crisis. Meanwhile, without an adequate staffing and implementation of measures to stimulate the demand for qualified personnel, the development of regions with the use of IIS mechanisms is impossible, and the preservation of the existing model of development of the industrial sector of Ukraine with the focus on low-tech production can lead to a further increasing of technological lagging behind the developed countries and weakening of competitive positions of the national economy.

Today, a peculiarity of the development of innovation integrated structures in Ukraine is the orientation towards traditional sectors – light industry, construction, agro-industrial complex, metallurgy, while the priority of European countries is the development of high-tech IISs in the sectors of mechanical engineering, bio-pharmaceutics and electronics. From our point of view, high-tech and science-intensive production in the sphere of biomedicine, information, nuclear, energy saving and space technologies should become the directions of development in Ukraine. In this regard, in the future, it is advisable to carry out a research on the staffing of formation of potential innovation integrated structures in terms of the branches of science. ■

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