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## **ASSESSMENT OF THE CAPABILITY TO IMPLEMENT KNOWLEDGE DEVELOPMENT BY REGIONS OF UKRAINE**

### **OCENA MOŻLIWOŚCI REALIZACJI ROZWOJU WIEDZY PRZEZ REGIONY UKRAINY**

### **ОЦЕНКА СПОСОБНОСТИ К ЗНАНИЕВОМУ РАЗВИТИЮ РЕГИОНОВ УКРАИНЫ**

#### **Abstract**

*The paper studies potentiality in innovation and knowledge state with regions of Ukraine that contributes to their knowledge development and formation of economics of knowledge on regional and national level. It determines the list of indices allowing the status assessment in innovation activity among economic players in a region, and that of research and scientific-technical works. Regions of Ukraine are grouped in accordance with the development level state in science and innovation activity. The article generalizes the potentiality assessment for the knowledge development of regions of Ukraine on the ground of the criteria of power of educational field, distribution of information and communication services, and potential in the sphere of science and innovations.*

**Keywords:** *knowledge economy, regions, assessment, grouping, innovation, science, education*

#### **Streszczenie**

*Przeanalizowano potencjalne możliwości statusu innowacyjno-naukowego regionów Ukrainy, które promują ich wiedzę i rozwój gospodarki opartej na wiedzy na poziomie regionalnym i krajowym. Określono skład wskaźników, który pozwala ocenić stan aktywności innowacyjnej podmiotów gospodarczych w regionie oraz prac i badań naukowych i technicznych. Regiony Ukrainy są pogrupowane według stopnia rozwoju stanu nauki i działalności innowacyjnej. Oceniane jest oszacowanie potencjału świadomego rozwoju regionów Ukrainy na podstawie kryteriów siły przestrzeni edukacyjnej, upowszechniania informacji i usług komunikacyjnych, potencjału w dziedzinie nauki i innowacji.*

**Słowa kluczowe:** *gospodarka oparta na wiedzy, regiony, ocena, grupowanie, innowacje, nauka, edukacja*

#### **Аннотация**

*Исследованы потенциальные возможности инновационно-научного состояния регионов Украины, которые способствуют их знаниемому развитию и формированию экономики знаний на региональном и национальном уровнях.*

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*Определен состав показателей, позволяющих оценить состояние инновационной деятельности, научно-технических работ и исследований субъектов хозяйствования в регионе. Сгруппированы регионы Украины по степени развития состояния науки и инновационной деятельности. Систематизирована оценка потенциала знанневого развития регионов Украины на основе критериев мощности образовательного пространства, распространения информационно-коммуникационных услуг, потенциала в сфере науки и инноваций.*

**Ключевые слова:** экономика знаний, регионы, оценка, группирование, инновации, наука, образование

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### **Statement of the problem in general outlook and its connection with important scientific and practical tasks.**

Provision of competitiveness and innovation, acquisition of the knowledge development signs in regional economy, and achieving economic growth tendencies could become possible for Ukraine provided strategic priorities are directed to economics of knowledge (EK) formation. That is why the choice of vectors for the regional economy development shall be based on determination and substantiation of head drivers for EK formation in regional and national manifestations, and establishment of the manner in which they influence its most important characteristics –


the ability to preserve and generate enough jobs of the appropriate standard, and the power to increase the amount of gross domestic (GDP) and regional (GRP) product orientating on the levers of the knowledge development in all spheres of public activities. To eliminate obstacles and to provide favorable environment for EK formation in Ukrainian regions it is necessary to introduce monitoring of indices' values in economy growth as one of the components of the knowledge development of a region.

### **Analysis of latest research where the solution of the problem was initiated.**

Ukrainian scientists study the opportunities for innovation and knowledge development of a region from various sides concentrating their attention on specific peculiarities of the process in the conditions of certain areas of the country. Thus, in the paper by V. Tyshchenko the assessment is given of the regional status of EK development using the basic components like innovations, education and ICT on which base regions of Ukraine are clustered [9]. The research by V. Geiets and V. Semnozhenko deals with the assessment of

technologic structures implementation in the economy of Ukraine, as well as innovation-investment activity and scientific potential of EK in regions of Ukraine [2, p. 201-224]. S. Katsura investigated the development tendencies in scientific and technical potential, innovation activity processes in industry, and the effectiveness of innovation infrastructure in its regional profile in Ukraine [3, p. 271-341]. At the same time, regardless of achievements availability related to the qualitative as-

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assessment of EK formation prospects in regions of Ukraine, the sufficiency of the in-

novation support for the knowledge development in the regional profile requires further substantiation.

### **Aims of the paper. Methods.**

So, the aim of the study is grouping of regions of Ukraine in accordance with the criterion of their progress stage in the sphere of science and innovations together with the assessment results generalization related to their level of the knowledge

development on the ground of considering peculiarities of the knowledge potential of educational field, and the extension of information and communication technologies. The methods of generalization, logics and mapping are used to provide the achievement of the specified study's aim.

### **Exposition of main material of research with complete substantiation of obtained scientific results. Discussion.**

The status assessment of the scientific and innovation component of the economy of Ukraine and that of the ability of EK formation is based upon the status establishment of its regions' knowledge development. To assess the potential of the knowledge development with regions of Ukraine various values are chosen characterizing EK from the viewpoint of the stage of their innovation activity and scientific achievements. To monitor the processes of available resources in the sphere of innovation, science and researches the following indices are used:

- The share of regional institutions involved in researches as well as scientific-technical works in their total number in Ukraine;
- The share of researchers' number involved in researches and developments in the average number of staff members in a region;
- The share of industrial enterprises of a region involved in innovation activity;
- The share of new technologic processes introduced in a region as respects to their total number in Ukraine;
- The share of enterprises in a region that sell innovation products as respects to their total number;

- The share of financing researches of a region in the total amount of financing in the country;
- Distribution of financing amount for researches and scientific-technical works according to their sources in the total amount structure of regional financing by structural elements, and namely: from state budget, from own funds, from institutions of entrepreneurship sector, and from foreign sources.

Such indices combining shall comprehensively characterize a region's potentiality as for the development state of innovation and scientific component of EK, determination of their disproportional reserves for breakthroughs in the sphere of high technologies. The indices selected allow an express-monitoring conduct using characteristics of innovation activity and researches in regions of Ukraine. They characterize various-aspect opportunities of the status establishment for EK and the knowledge development in regional profile on the ground of the processes of a region's labor forces attraction to research activity; participation of economy players in researches, scientific and technical works, and innovation activity in a region; ability to finance scientific and innovation

measures from different courses on the level of regions; advanced technologies utilization and modern technologic processes introduction in the activities of economy players, and, as a result, their ability to produce competitive innovation goods and services, Table 1.

In order to increase the level of visualization of the data represented the value of each of the indices was grouped according to three levels – high, medium and minimal – correspondingly shown in different colors. Such approach simplifies the procedure of grouping of regions of Ukraine based on the criteria of assessment of potentiality in the sphere of science and innovations thus giving the opportunity to optimize and supplement the content of information and to form the full-grown understanding of regions’ advantages and bottlenecks for the sake of EK formation in the regional profile, Table 2.

It was established on the ground of the findings that by all assessment criteria the stable leaders in potential opportunities for

the knowledge development are City of Kyiv and Kharkiv Region. Here research activity in 2009 and 2016 was 67 per cent financed from the state budget of Ukraine. They are characterized by maximal values of indices assessing the state of science and innovation activity, and have the large breakaway between indices’ values in other spheres. So they were recognized to be stable leaders in the sphere of science and innovation activity, and excluded from the further study in order to allow other regions ranging by the chosen criteria.

The sufficiently high level of concentration of institutions involved in researches and scientific-technical works is typical for Dnipropetrovsk, Zaporizhia, Lviv and Odesa Regions. In other regions one could observe the approximately same level of regional institutions’ share involved in researches i.e. they have similar conditions for innovation activity conduct on the ground of their outputs providing regional opportunities as for activation of processes forming EK.

**Table 2. The range of values with criteria of assessment in the sphere of science and innovation activity for ranging of regions of Ukraine (with the exception of City of Kyiv and Kharkiv Region)\***

Ranging description for regions of Ukraine	The share of regional institutions involved in researches and scientific-technical works in their total number, %		The share of researchers’ number involved in researches and developments in the average number of staff members in a region, %		The share of industrial enterprises of a region involved in innovation activity, %		The share of new technologic processes introduced in a region as respects to their total number in Ukraine, %		The share of enterprises in a region that sell innovation products as respects to their total number, %		The share of financing researches of a region in the total amount of financing in the country, %	
	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016
Quantization step	1,94	2,23	0,36	0,43	5,03	5,3	2,22	2,27	3,33	8,04	1,64	4,11
Minimal value of index	0,45	0,82	0,05	0,05	6,13	10,19	0,42	0,17	3,59	5,22	0,11	0,1
Bounds of the first group	2,39	3,05	0,41	0,48	11,16	15,49	2,64	2,44	6,92	13,26	1,75	4,21
Bounds of the second group	4,33	5,28	0,78	0,91	16,19	20,79	4,86	4,72	10,24	21,31	3,40	8,31
Maximal value of index	6,27	7,51	1,14	1,34	21,22	26,09	7,08	6,99	13,57	29,35	5,04	12,42

\*Developed by the author on the ground of data [5-8]

One should state that in 2009 and 2016 research workers whose activity determined the effectiveness of researches were mainly located in Dnipropetrovsk, Zaporizhia, Lviv, Mykolaiv, Odessa and Sumy Regions. Various fluctuations towards the decrease of the share of researchers' number involved in researches and developments in the average number of staff members in a region took place in Donetsk Region having represented almost 13.2 times index reduction in 2016 as compared with 2009.

The highest attraction of industrial enterprises to innovation activity is registered in

Zaporizhia, Zhytomir, Ivan-Frankivsk, Lviv, Mykolaiv, Odessa, Ternopil and Chernivtsi Regions. In 2016 the share of industrial enterprises involved in innovation activity related to their total number in the abovementioned regions was 20 to 26 per cent. The head kinds of their economic activity include the production of basic pharmaceutical goods and drugs, computers, electron and optic articles, transport vehicles, coke, and oil refining products [5, p. 83].

**Table 1. Assessment of potentialities in the sphere of science and innovations for the knowledge development of regions of Ukraine\***

	The share of regional institutions involved in researches and scientific-technical works in their total number, %		The share of researchers number involved in researches and developments in the average number of staff members in a region, %		The share of enterprises of a region involved in innovation activity, %		The share of new technological processes introduced in a region as respects to their total number in Ukraine, %		The share of enterprises in a region that sell innovation products as respects to their total number, %		The share of financing researches of a region in the total amount of financing in the country **, %		Distribution of financing amount with researches and scientific-technical works according to their sources in the total amount of financing by structural elements, and namely: from state budget, from own funds, from institutions of entrepreneurship sector, and from foreign sources, %	
	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016
Ukraine ***	100.0	100.0	1.12	1.24	12.83	18.86	10.0	10.0	10.17	13.26	100.0	100.0	44.8	24.22
Vantsia	1.64	2.06	0.25	0.26	12.23	15.38	3.65	0.86	3.79	11.61	0.53	0.24	44.25	28.2
Volyn	1.03	1.03	0.16	0.15	9.17	10.19	0.48	0.49	3.44	12.04	0.20	0.13	34.54	10.1
Dnipropetrovsk	6.27	5.97	1.05	1.22	8.19	14.74	2.64	2.75	8.19	10.66	4.80	12.42	25.2	23.45
Donetsk	5.00	1.54	0.66	0.05	9.56	13.76	3.91	1.72	8.11	6.38	3.63	1.51	34.26	31.9
Zhytomir	0.67	0.93	0.14	0.17	10.48	20.61	0.95	1.06	11.57	13.33	0.28	0.15	62.28	9.1
Zakarpattia	1.34	0.93	0.37	0.40	13.58	11.19	0.48	0.52	10.49	5.22	0.55	0.35	90.8	1.2
Zaporizhia	2.69	3.09	1.14	1.13	7.03	22.07	7.08	3.41	6.78	23.00	0.97	4.55	8.5	33.54
Ivano-Frankivsk	1.64	1.75	0.35	0.27	21.22	21.09	1.80	0.49	11.60	11.72	0.36	0.15	25.1	75.1
Kyiv	2.54	2.88	0.79	0.53	9.41	16.61	1.53	2.44	9.31	12.46	3.55	1.76	69.21	5.0
Kirovograd	0.97	1.54	0.21	0.27	10.74	17.89	1.37	2.78	13.57	15.79	0.13	0.52	15.78	7.0
Lugansk	3.58	1.44	0.31	0.25	9.87	13.24	0.74	0.17	5.52	5.88	0.62	0.25	22.23	27.27
Lviv	5.97	7.51	0.91	0.98	13.01	20.58	2.96	3.98	5.35	14.15	5.04	2.47	64.3	23.7
Mykolaiv	3.51	2.57	1.12	1.08	13.29	23.08	1.53	0.72	7.26	15.38	2.02	2.72	28.14	10.61
Odessa	4.63	4.84	0.71	0.79	14.18	20.94	1.37	1.81	11.70	13.09	3.36	1.83	63.13	16.7
Poltava	1.64	2.16	0.29	0.42	12.47	13.97	1.48	0.72	8.40	12.39	0.57	0.39	43.26	9.21
Rivne	0.97	1.13	0.12	0.18	11.84	17.04	0.42	1.06	3.59	8.15	0.19	0.08	59.20	21.0
Sumy	1.64	1.65	0.84	1.34	16.21	17.80	4.12	6.99	4.80	20.34	0.62	1.10	20.56	20.4
Ternopil	1.04	1.34	0.18	0.25	17.97	26.09	0.48	2.44	9.27	29.35	0.21	0.10	54.6	35.0
Kharkiv	15.67	16.46	2.91	2.87	15.85	30.47	40.15	5.82	16.62	21.61	13.61	17.46	35.7	41.17
Kherson	1.72	2.06	0.42	0.41	12.17	19.79	0.95	1.00	10.45	15.63	0.66	0.31	74.18	8.0
Chmelnitstvn	0.45	0.82	0.05	0.15	6.13	12.77	0.74	0.57	6.19	8.51	0.11	0.14	65.30	7.0
Cherkasy	2.09	2.06	0.43	0.35	11.86	16.11	1.06	0.49	7.48	18.12	0.58	0.90	37.53	9.0
Chernivtsi	1.79	1.95	0.08	0.72	16.74	20.37	0.58	0.29	11.32	16.67	0.50	0.41	50.6	13.31
Chernyiv	1.64	1.54	0.28	0.38	21.01	15.24	1.53	2.09	8.84	10.48	0.70	0.46	59.20	3.19
City of Kyiv	25.52	30.76	4.20	3.94	26.15	23.06	15.27	55.35	37.22	18.34	53.78	49.59	57.1	19.20

\* Calculated and grouped by the author on the ground of the data [5-8]  
 \*\* Information on the cost of researches conduct in 2016 is represented in accordance with the new methodology of organization and conduct of government statistic monitoring "Execution of researches and developments (with the exception of costs for scientific-technical services)  
 \*\*\* For the year of 2009 the information is represented with the exception of Sevastopol Town and AR of Crimea  
 Legend:  - high level;  - medium level;  - initial level;  -le areas-leaders

Meanwhile, enterprises' effectiveness in these regions characterized by manufacture and distribution of innovation products is not similar. The best achievements in the innovation activity among industrial enterprises is observed in Zaporizhia and Ternopil Regions where in these indices they pass ahead of such stable Ukrainian leaders as Kharkiv Region and the City of Kyiv that is the evidence of the high effective-

ness of their activity in the sphere of science and innovations, and the presence of considerable potential for the knowledge development. Considering the values of such indices as the share of new technological processes introduced in a region as respects to their total number in Ukraine and the share of financing researches of a region in the total amount of financing in the country it is established that regions of Ukraine with the

exception of the aforesaid leaders have their approximately equal level that corresponds to the minimal one in the given gradation. What could be singled out are only Zaporizhia and Sumy Regions that are famous for the high level of technologies introduction to production and commercial activity of economy players, and Dnipropetrovsk and Zaporizhia Regions having the largest share of financing research works distributed between the regions of Ukraine. Thus practically all regions of Ukraine have similar satisfactory conditions from the viewpoint of the presence of financial opportunities and introduction of modern technologies.

Besides, the study includes calculations on determination of the distribution structure for the financing volume among scientific and scientific-technical works by sources for each region of Ukraine. The most cost-consumptive elements were chosen as the ground for structural element of financing sources including costs from state budget, from entrepreneurship institutions, from foreign investors, and from own funds. It was established that in the year of 2016 Volyn, Zakarpatia, Ivano-Frankivsk, Kyiv, Lviv, Rivne, Ternopil, Kherson, and Khmelnytskyi Regions were being financed from the state budget of Ukraine, local government bodies and off-budget funds by 60-82%. Changes in the structure of financing sources for the progress of researches and developments with the prevailing attraction of own funds (in 2016 there were 48 to 87 per cent of financing research and scientific-technical works for the account of own funds as related to their total amount in the regions) took place in Donetsk, Kirovograd, Mykolaiv, Sumy, and Cherkasy Regions. In Dnipropetrovsk Region there appeared the significant, up to 82%, prevailing of entrepreneurship sector in the structure of financing researches and scientific-technical works. Meanwhile the

leaders in acquisition of funds from foreign investors are Zaporizhia, Lugansk, Cherkasy, and Chernigiv Regions.

Transition “from centralized planning, state financing of researches for the benefit of market stimuli and market demand on developments” was used in the strategic guidelines for EK formation in the implementation of first innovation programs in China [4, p. 11]. In other words, for the knowledge development of regions it is necessary to activate financial sources either from own funds or from entrepreneurship sector.

Complex analysis of regional potentialities in the sphere of science and innovations in Ukraine on the ground of selected indices allows the fact establishment Dnipropetrovsk, Zaporizhia, Lviv, Mykolaiv, Odesa and Sumy Regions to be leaders of the knowledge growth and demonstrate the high stable facilities for research and innovation activity execution by economy players, the corresponding conclusion having been made based on the high share of institutions involved in researches and scientific-technical works and introduction of innovation initiatives to production and economic activity having the substantial concentration of research workers for implementation of prospective strategies of EK formation. Meantime the stable medium level on the ground of the same criteria is represented in Zhytomir, Kyiv, Kirovograd, Ternopil, and Ivano-Frankivsk Regions while in Vinnitsa, Volyn, Donetsk, Zakarpatia, Lugansk, Poltava, Rivne, Kherson, Chernivtsi, Cherkasy, Chernigiv and Khmelnytskyi Regions there is a stable minimal level of the knowledge growth potential.

So, as a result of findings systematization and generalization of the study conducted, regions of Ukraine were divided into four homogeneous groups in accordance with the potentialities in the sphere of science



and innovations for the knowledge development (Table 3). Such grouping of Ukrainian regions shall become the basis for the development of targeted strategies of EK formation considering their peculiarities and potential opportunities as for implementation of scientific and innovation activity, those of financing for researches and scientific-technical works of a region as well as the conditions created for researchers' assignment involved in researches and developments.

Thus, as a result of the study four groups of regions were specified in Ukraine their difference being in the potential of the knowledge development. The first group includes the City of Kyiv and Kharkiv Region which during the period of the study could be characterized as stable leaders in the sphere of science and innovations in Ukraine having the highest potential for the knowledge development according to the entire selected criteria of assessment. The

second group covers Dnipropetrovsk, Zaporizhia, Lviv, Mykolaiv, Odesa and Sumy Regions having the sufficiently powerful potential of basic opportunities as for implementation of scientific and innovation activity by economy players, and being characterized by the indices growth tendencies in the sphere of science and innovations.

The third group containing Zhytomir, Kyiv, Kirovograd, Ternopil, and Ivano-Frankivsk Regions is characterized by the medium potential of the knowledge development due to the activation degree in innovation and scientific activity. The fourth group includes Vinnitsa, Volyn, Donetsk, Zakarpatia, Lugansk, Poltava, Rivne, Kherson, Chernivtsi, Cherkasy, Chernigiv, and Khmelnytskyi Regions that have a satisfactory potential for the knowledge development and are characterized by the minimal level or the majority of indices selected for the analysis purposes.

**Table 3. Grouping of regions of Ukraine and the City of Kyiv in accordance with their potential in the sphere of science an innovation activity in 2009- 2016 \***

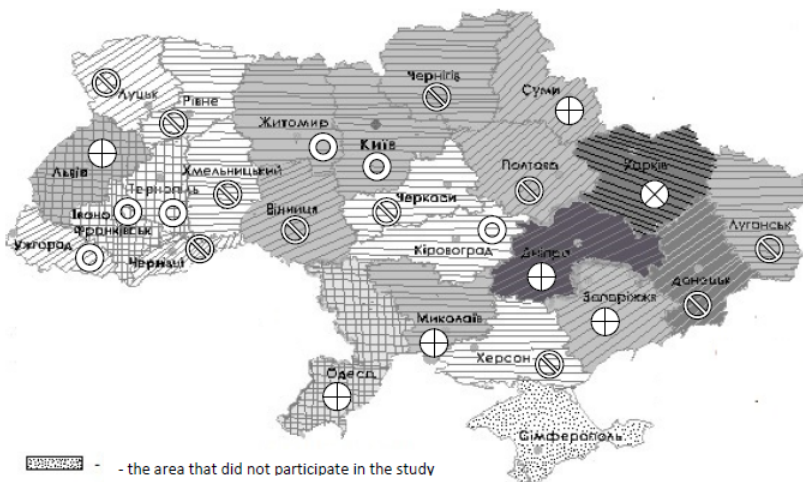
Group No	Regions of Ukraine grouped in accordance with their potential level in the sphere of science and innovations	Potential characteristics of the knowledge development with regions groups due to functioning of the sphere of science and innovations
1	City of Kyiv, Kharkiv	Stable regions-leaders have the best potential of the knowledge development according to all criteria of potentialities assessment in the sphere of science and innovations
2	Dnipropetrovsk, Zaporizhia, Lviv, Mykolaiv, Odesa, Sumy, and Ternopil	Regions have the excellent level of the knowledge development potential. They are characterized by the high potential in the sphere of science and innovations as well as the significant potential that exists due to economy players involved in innovation activity and scientific-technical works. The majority of researchers are concentrated in these regions thus providing the greatest opportunity to produce innovation products. There is a tendency observed of the improvement of selected criteria's values for potentialities assessment in the sphere of science and innovations.
3	Zhytomir, Kyiv, Kirovograd, Ivano-Frankivsk	Regions have the medium level of the knowledge development potential. They are characterized by the medium potential in the sphere of science and innovations related to the environment formation for innovation activity conduct. In isolated cases there are improvements of indices in the assessment of science and innovation component of EK.
4	Vinnitsa, Volyn, Donetsk, Zakarpatia, Lugansk, Poltava, Rivne, Kherson, Chernivtsi, Cherkasy, Chernigiv, Khmelnytskyi	Regions have the satisfactory level of the knowledge development potential. They are characterized by the minimal application level in the sphere of science and education. There is a tendency observed of the reduction of selected criteria or their insignificant improvement.

\*Grouped by the author

Rating of the regions as belonging to the fourth group is the evidence of their poor potentialities level as for EK formation by the component of science and innovations. Thus, monitoring the capacity of the regions of Ukraine to implement the development of knowledge in connection with their scientific and innovative potential has allowed forming the characteristics associated with the possibilities of forming EK in the regions of Ukraine. Consequently, in the study the integral assessment is obtained on the preconditions for the regions' knowledge development due to the basic components like the knowledge power of

educational field in a region, extension of advanced information and communication technologies, and potentialities in the sphere of science and innovations. Unification of clustering results with regions classification by the chosen components as well as the use of the mapping method allowed the general characteristics creation for each region of Ukraine that, in its turn, allows identification of advantages, bottlenecks and threats for the purpose of development of targeted strategies for EK formation on national, regional and local level, Fig. 1

**Fig. 1 Potential assessment of the knowledge development of regions of Ukraine in 2016**



*Legend:*

Characteristics of the knowledge development of regions of Ukraine	Groups / Clusters of regions			
	1 Leader's level	2 Excellent level	3 Medium level	4 Satisfactory level
The state of the knowledge power of the educational field of regions				
The state of extension of information and communication services [1]				
The state of potential in the sphere of science and innovations				

*\*Developed by the author*

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Each region of Ukraine and the City of Kyiv thus received different combinations of characteristics as for the state of the knowledge development, Table 4.

**Table 4. Complex characteristics of preconditions for EK formation in the City of Kyiv and regions of Ukraine**

Names of Regions	The state of the knowledge power of the educational field	The state of extension of information and communication services	The state of potential in the sphere of science and innovations
Vinnitsa	3	4	4
Volyn, Zakarpatia, Chernivtsi	3	3	4
Dnipropetrovsk	3	2	2
Donetsk	3	2	4
Zaporizhia, Sumy	3	4	2
Ivano-Frankivsk	2	3	3
Kyiv, Zhytomir	4	4	3
Kirovograd	4	3	3
Legansk, Chernigiv	4	4	4
Lviv	2	4	2
Mykolaiv	4	4	2
Odesa	2	1	2
Poltava	3	4	4
Terнопil	2	3	2
Kharkiv	1	2	1
Rivne, Kherson, Khmelnytskyi, Cherkasy	4	3	4
City of Kyiv	1	1	1

*\*Developed by the author*

## Conclusions.

The highest level of the knowledge development is demonstrated by the City of Kyiv and such Regions as Kharkiv and Odesa. The poorest level is demonstrated by such Regions as Zhytomir, Kyiv, Lugansk, Chernigiv, Rivne, Kherson, Khmelnytskyi, and Cherkasy. Other regions of Ukraine have different combinations of characteristics of the knowledge development being in disproportional conditions for knowledge acquisition by their

population of various ages, ICT usage on individual, regional and national level, and the effectiveness increase with science and innovation activity. So, regions of Ukraine are characterized by different levels of the knowledge development and the degree of preparedness for EK formation that requires the designing of measures' complex to activate the processes of generation as well as dissemination and implementation of knowledge.

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