

**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

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**METHODICAL APPROACH FOR ASSESSMENT OF THE INTERACTION OF HIGHER EDUCATION SYSTEM AND INFORMATION ECONOMY**

**МЕТОДИЧНИЙ ІНСТРУМЕНТАРІЙ ОЦІНКИ ВЗАЄМОВПЛИВУ СИСТЕМИ ВИЩОЇ ОСВІТИ ТА ІНФОРМАЦІЙНОЇ ЕКОНОМІКИ**

**Urgency of the research.** The current tendency of the national economy development is the development of the information economy, characterized by the defining role of information and information technologies in the processes of production, exchange, distribution, consumption of public goods and the effective functioning of which are provided by sectors capable of generating knowledge, high quality scientific products and productive use of information resources.

**Target setting.** The existence of mutual influence of higher education and information economy has been proved, which is manifested in the presence of correlation between the rates of development of this type of economic system and the development of partnership between business and universities, in particular in the fields of training and research.

**Actual scientific researches and issues analysis.** The theoretical and methodological basis for the study are the works of D. Bell, Z. E. Toffler, Yu. S. Kristinevich, V. Kutsenko, I. Malik, R. Tolstyakova, L. Fedulova, A. Chukhna and others.

**Uninvestigated parts of general matters defining.** Despite the high interest of scientists in the problems of development of the higher education system in the context of informatization of the national economy, the question of improving the methodological tools for assessing the components of the information economy and analyzing the impact of higher education on its development processes remain open.

**The research objective:** development and testing of a comprehensive methodological approach to assessing the development of educational, innovative, research components of the information economy.

**The statement of basic materials.** The article proposes and approves a methodical approach to assessing the development of the information economy in the three-dimensional space of features grouped within the educational, research and innovation components. The structure of a complex integral indicator, the cluster analysis of Ukrainian regions was constructed.

**Conclusions.** The measures of state regulatory impact, structured in accordance with the pace of development of the structural components of the information economy, are specified.

**Keywords:** higher education system; university; information economy; methodical approach; educational, research, innovation component of the information economy; cluster analysis; index analysis.

**Актуальність теми дослідження.** Актуальною тенденцією розвитку національної економіки є становлення інформаційної економіки, для якої характерна визначальна роль інформації у процесах виробництва, обміну, розподілу, споживання суспільних благ і ефективне функціонування якої забезпечують сектори, спроможні до генерації знань, високоякісних наукових продуктів та продуктивного використання інформаційних ресурсів.

**Постановка проблеми.** Взаємовплив вищої освіти та інформаційної економіки проявляється в наявності кореляції між темпами розвитку інформаційної економіки та розвиненістю партнерства бізнесу й університетів, зокрема у сферах підготовки кадрів і науково-дослідної діяльності.

**Аналіз останніх досліджень і публікацій.** Теоретико-методологічну базу дослідження становлять праці Д. Белла, З. Бжезинського, Ж. Бодрійяра, В. Іноземцева, М. Кастельса, Й. Масуда, Ф. Махлупа, М. Пората; Т. Боголіб, В. Гейця, С. Гринкевич, М. Згуровського, О. Іляш, Г. Іцковця, І. Каленюк, С. Кристиневича, І. Малік, Р. Толстякова, Л. Федулової, А. Чухна та ін.

**Виділення недосліджених частин загальної проблеми.** Залишаються відкритими питання удосконалення методичного інструментарію оцінювання компонент інформаційної економіки та аналізу впливу вищої освіти на процеси її розвитку.

**Постановка завдання:** розробка й апробація комплексного методичного підходу до оцінювання розвитку освітньої, інноваційної, дослідницької компонент інформаційної економіки.

**Виклад основного матеріалу.** Запропоновано методичний підхід до оцінки розвитку інформаційної економіки у тривимірному просторі ознак, згрупованих у межах освітньої, дослідницької та інноваційної компонент. Сконструйовано структуру комплексного інтегрального показника; проведено кластерний аналіз регіонів України за рівнями розвитку компонент інформаційної економіки.

**Висновки.** Конкретизовано заходи державного регулюючого впливу, структуровані відповідно до темпів розвитку структурних компонент інформаційної економіки.

**Ключові слова:** система вищої освіти; університет; інформаційна економіка; методичний підхід; освітня, дослідницька, інноваційна компоненти інформаційної економіки; кластерний аналіз; індексний аналіз.

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**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

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**Urgency of the research.** The revitalization of the processes of informatization of the national economy leads to an increase in the role of higher education as a system of training highly qualified personnel and the generation of new knowledge, information, innovative technologies. Transformational processes of information society development present complex challenges and challenges, requiring higher education institutions to be prepared for productive and effective functioning in new conditions. Such challenges include the following: dynamic social and economic processes; transformation of knowledge, information into a product, productive power; dissemination of information and communication technologies; virtualization of workplaces; formation of a global information field; aggravation of information security problems; updating copyright issues. The effective functioning of universities in the new socio-economic context slows down the conservatism of universities and the inability of most of them to respond to current and prospective labor market demands.

**Target setting.** This is compounded by the imbalance of universities' links with the real economy. This leads to deepening financial problems, limiting private investment in the higher education system, and also narrows the possibility of updating the material and technical base, which is currently in a poor state, which, in the aggregate, makes it impossible to integrate modern information and communication technologies in educational and research processes of institutions. higher education. The outline actualizes conducting a systematic study of the development of the national higher education system in the conditions of becoming an information economy with an emphasis on determining the strategic guidelines for ensuring the adaptability of such a system to the challenges of environmental turbulence.

**Actual scientific researches and issues analysis.** Important contribution to substantiating the role of education in ensuring sustainable economic development has been made by such foreign scientists as A. Ashkerov, R. Anderson, G. Becker, H. Bowen, A. Bethlehem, E. Denison, M. Kviek, S. Kostanyan, I. Miner, J. Newman, J. Stiglitz, M. Oakeshott, M. Heidegger, G. Schnadelbach, T. Schultz, K. Jaspers and others. Socio-economic aspects of the development of the higher education system in the conditions of informatization of society were investigated in the works of domestic scientists: V. Andrushchenko, L. Antoshkina, T. Bogoglib, N. Vdovenko, A. Galchinsky, A. Gritsenko, O. Grishnova, I. Kaleniuk, V. Kremen, O. Kuklin, V. Kutsenko, O. Levchenko, V. Lugovoi, and others.

The theoretical and methodological basis for the study of the information economy, its prerequisites, factors and features of development are the works of D. Bell, Z. E. Toffler. Questions of the theory and practice of developing the information economy and the place of the higher education system in the corresponding processes are covered in the works of Yu. V. Kutsenko, I. Malik, R. Tolstyakov, L. Fedulova, A. Chukhna and others.

**Uninvestigated parts of general matters defining.** The scientific achievements of these scientists are undoubtedly important for the formation of the theoretical foundations of the development of the higher education system in the conditions of information economy. However, the questions of improving the methodological toolkit of assessing the components of the information economy and analyzing the impact of higher education on its development processes remain open.

**The research objective.** The purpose of the article is to develop and approve a comprehensive methodological approach to assess the development of educational, innovative, research components of the information economy.

**The statement of basic materials.** In the course of the research we have developed a comprehensive methodological approach to assessing the development of the information economy, which involves the combination of statistical, index, cluster methods of analysis, as well as the separation of the main components of the information economy: educational, research, innovation. This approach is implemented in three blocks:

*Block 1* - using the method of statistical analysis allowed to estimate the initial level of readiness of the higher education system of Ukraine for development in the conditions of formation of the information economy (Tab. 1). This revealed the decisive trends in the development of the object

**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

under study: a reduction in the number of higher education institutions (by 10.5% in 2018 compared to 2000); decrease in the number of students (by 5.7% in 2018 compared to 2000); reducing expenditures on higher education in terms of aggregate government spending (from 6.8% in 2009 to 3.7% in 2017); the share of higher education expenditure in the total GDP of the country has also decreased (from 2.3% in 2009 to 1.5% in 2016). The reasons for the identified trends are accordingly: the policy of optimizing the structure of higher education institutions; complication of the demographic situation in the country, which is burdened by migration processes and a decrease in the competitiveness of domestic universities; reduction of state funding of the higher education system; low diversification of financial sources of most higher education institutions in Ukraine.

Table 1

**Indicators for the Development of Higher Education in Ukraine in 2000–2018**

Year	Number of higher education institutions	Number of applicants for higher education, (thousand)	Expenditures of the state budget for higher education, mln.hrn	Share in total government expenditures, %	Share in GDP, %
2000	315	1402,9	2 285,5	4,7	1,3
2005	345	2203,8	7 934,1	5,7	1,8
2009	350	2245,2	20 966,3	6,8	2,3
2010	349	2129,8	24 998,4	6,6	2,3
2011	345	1954,8	26 619,6	6,4	2,0
2012	334	1723,7	21 058,1	6,3	2,0
2015*	288	1375,2	30 981,8	4,6	1,6
2016*	287	1369,4	35 233,6	4,2	1,5
2017*	289	1330	38 681,1	3,7	-
2018*	282	1322,3	-	-	-

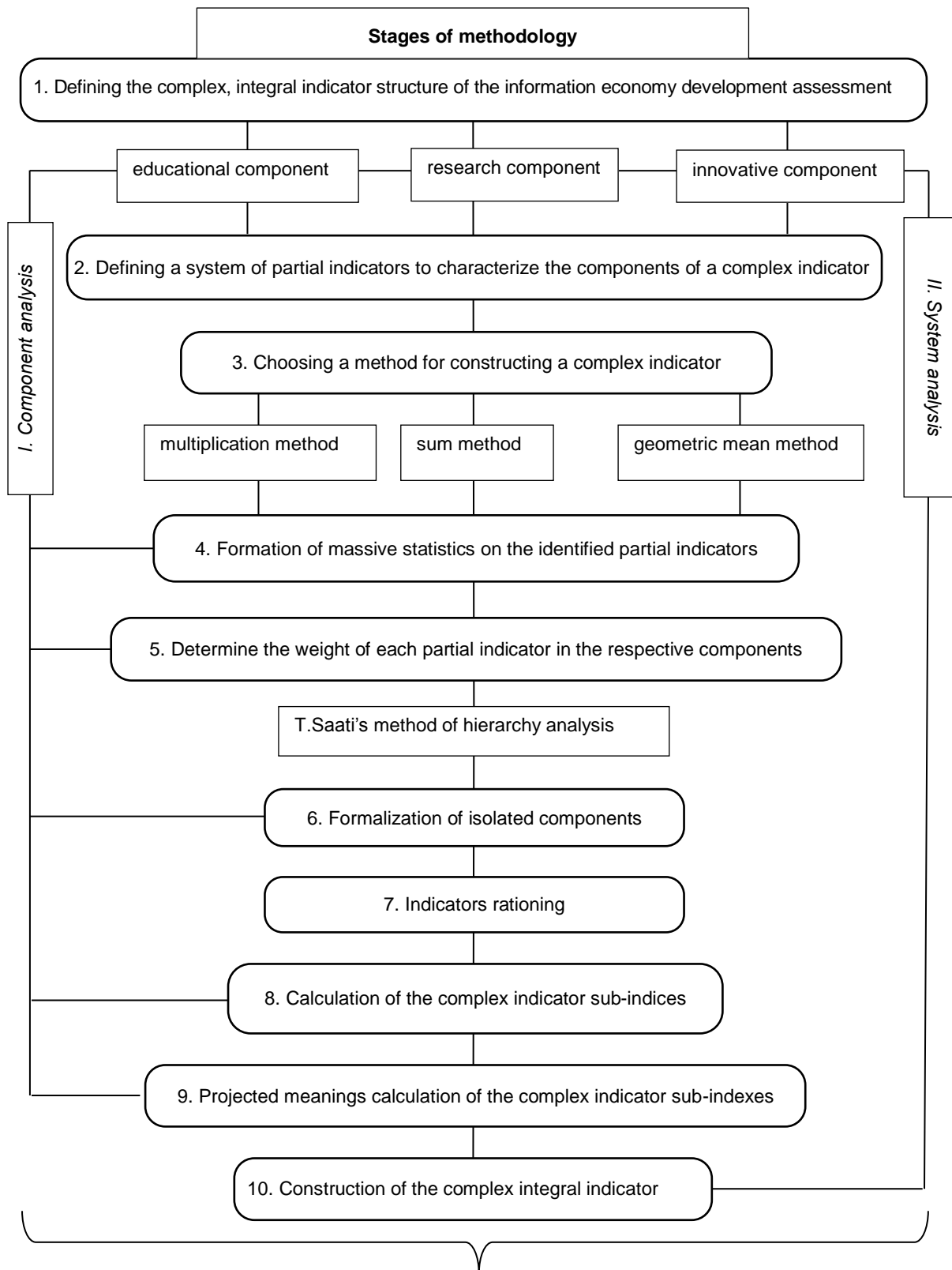
\* - without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Lugansk regions.

**Source:** compiled by the authors on the basis of official data of the State Statistics Service of Ukraine

Block II - using of the index analysis method [4; 10; 12] revealed the trend of development of the information economy, within which the educational, research and innovation indices were distinguished (Fig. 1).

The results obtained testify to the fact that the information economy in Ukraine is at the stage of formation (since 2015, there has been a positive dynamics of the integrated integral indicator). The military-political situation in the East of Ukraine exacerbated the negative impact on the development of this type of economic system and its individual components (decline in 2014–2015). Negative trends in the development of the national higher education system were also reflected in the dynamics of the educational component index, which confirms the relevance of the development of science-based measures to ensure the adaptability of the higher education system to the conditions of becoming an information-type economy.

**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**



**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

Continuation of Fig. 1

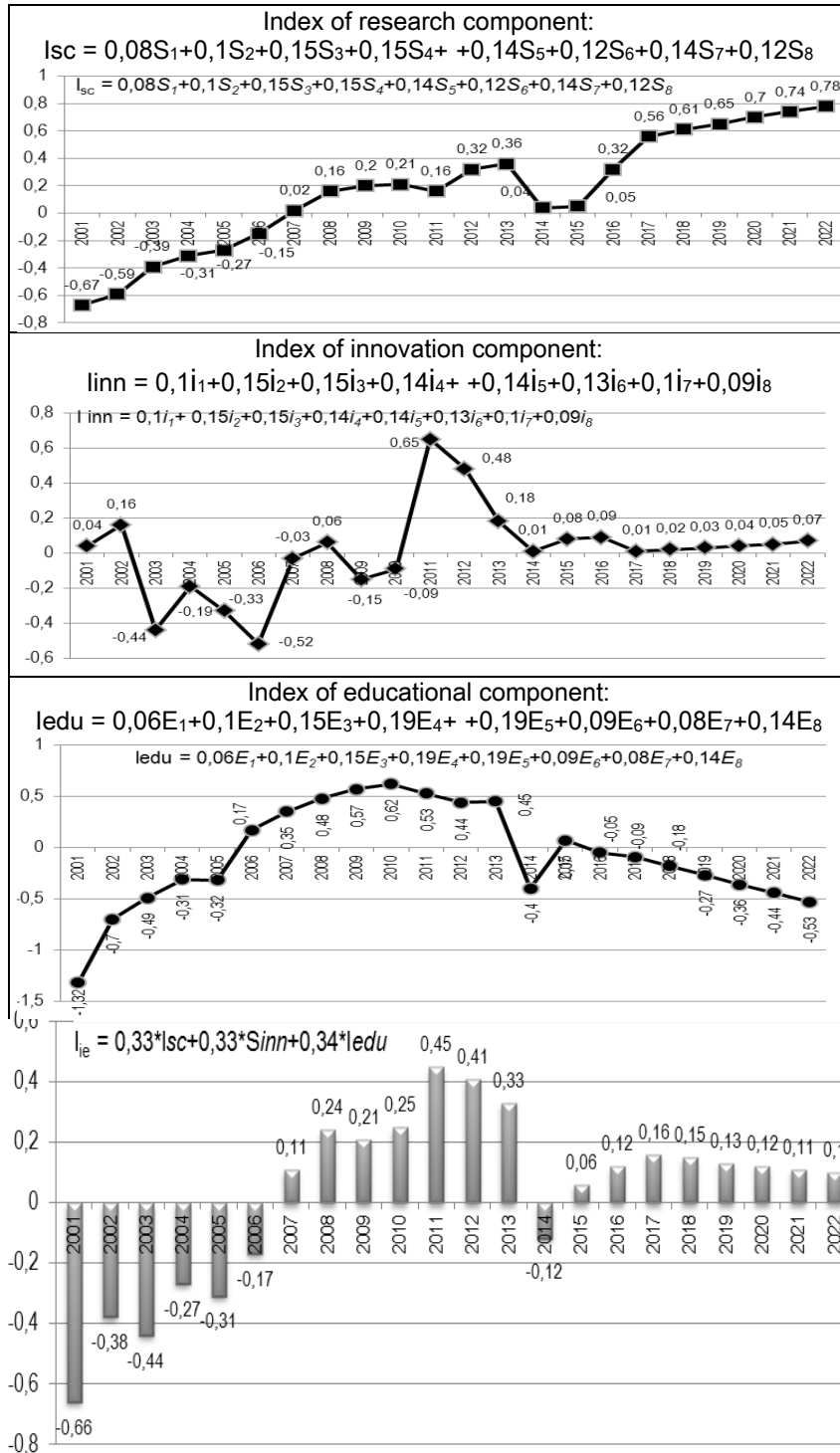


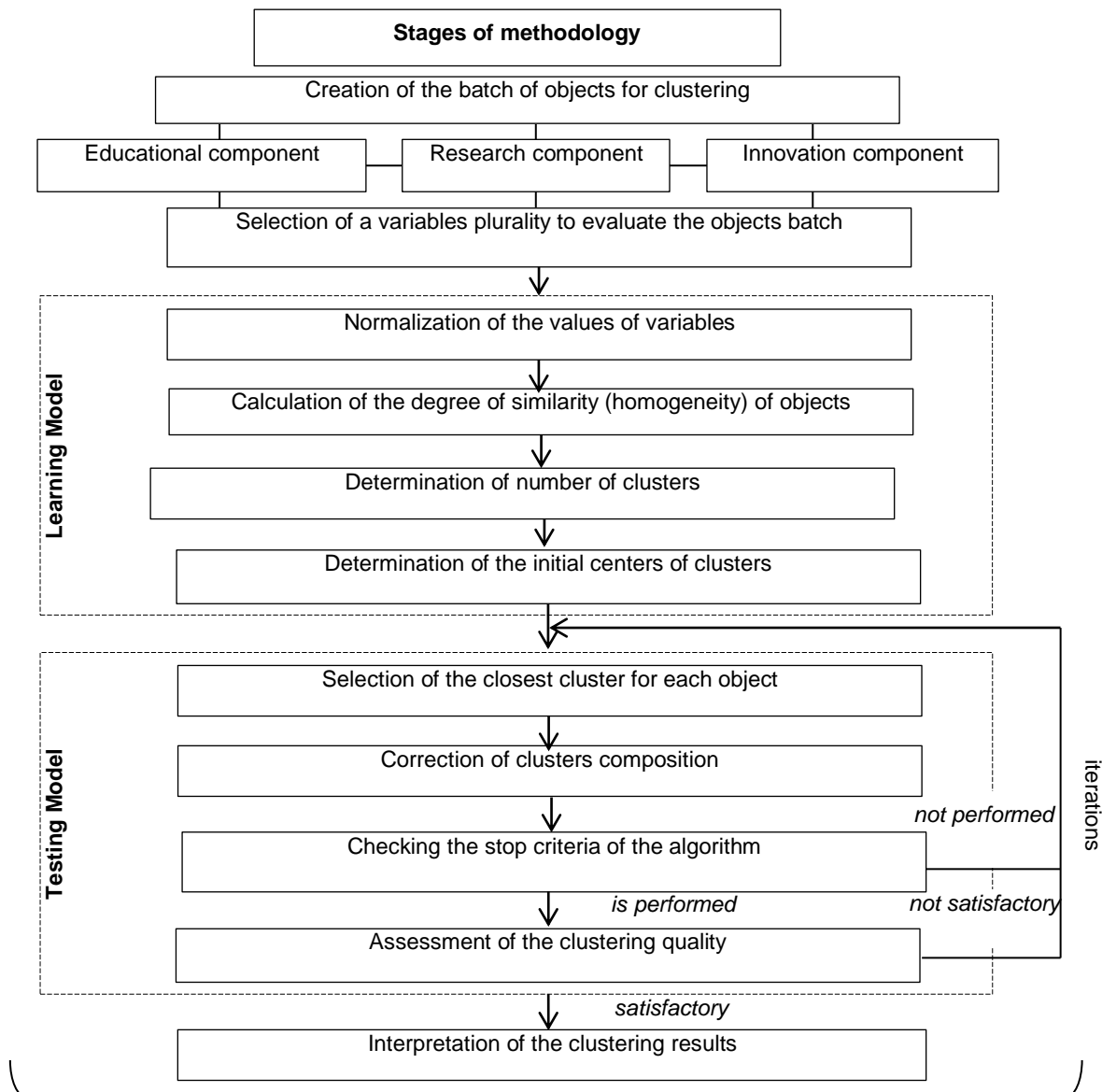
Fig. 1. Index analysis results of information economy development in Ukraine (compiled by the authors)

**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

Block III - using of the clustering method [1-3; 5-9; 11; 13-15] allowed to deepen the results obtained in the previous stages by conducting a mesoeconomic analysis on the educational, research and innovation components of the information economy (Fig. 2).

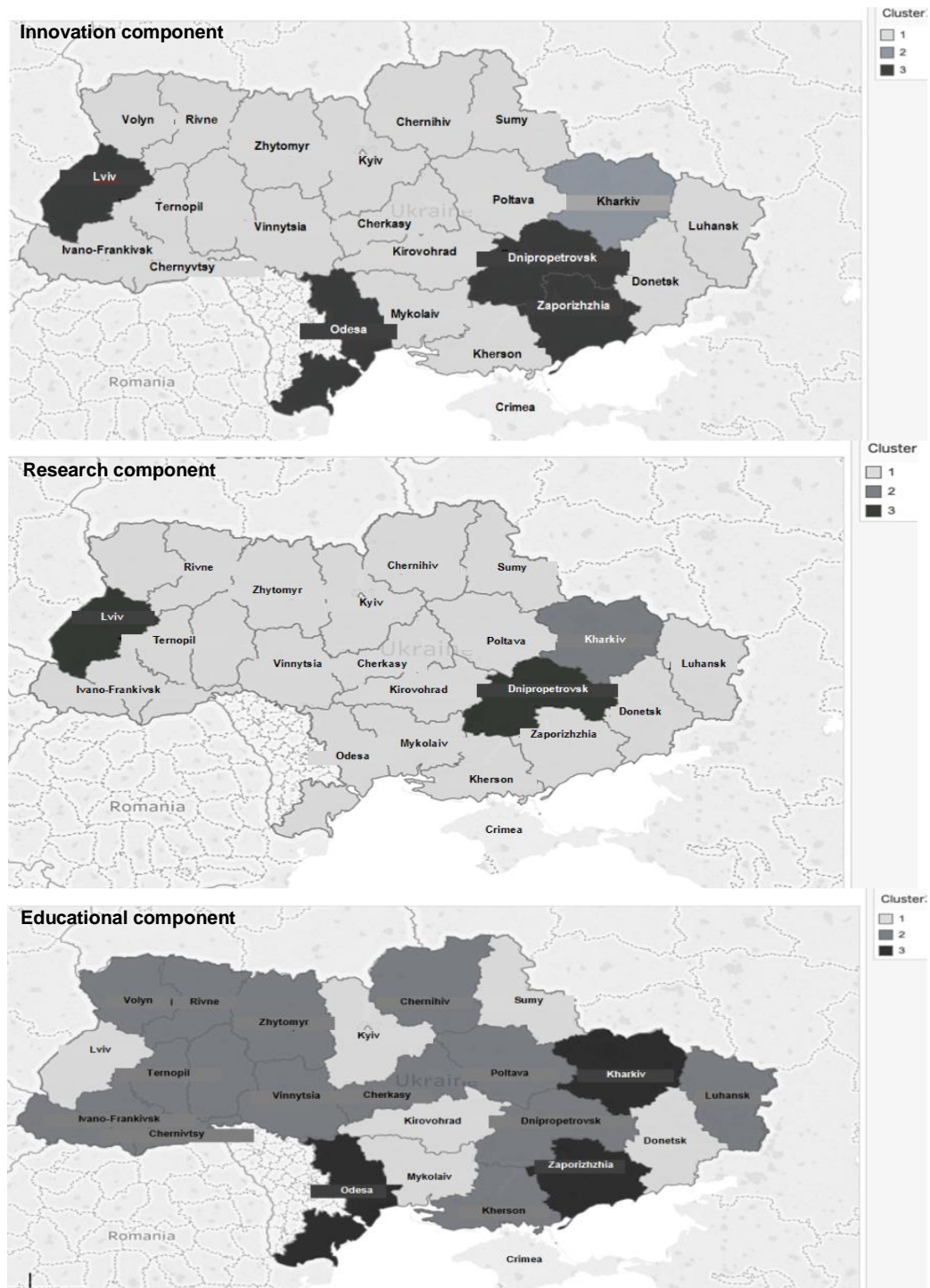
The results of the analysis showed the existence of regional imbalances in the development of information-type economy in Ukraine. This led to a differentiated approach to identify the potential of the higher education system to activate the processes of informatization at the mesoeconomic level, taking into account that the results of higher education institutions are reflected not only in the educational, but also in the research and innovation components of the development of the information economy.

On the basis of the results of approbation of a complex methodological approach, systemic problems of development of higher education of Ukraine in the conditions of information economy were identified: contextual, regulatory, organizational, economic, financial, material and technical, globalization (Tab 2).



**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

Continuation of Fig. 2



**Fig. 2. Cluster distribution of regions of Ukraine by level of development of information economy components (compiled by the authors)**

**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

Table 2

**System problems of higher education development in Ukraine in terms of information economy**

Type of problem	Content of the problem	Approaches to the solution
<b>Contextual</b>	irrelevance or discrepancy of the educational process and research topics to the business requests	A complex approach to adjustable solution of this type of problem based on the synchronization of the interests of higher education institutions, public and business entities.
<b>Legal</b>	maladjustment of the provisions of current legislation regarding the commercialization of intellectual property objects by universities; low level protection of intellectual property rights	Scientific-applied approaches to the transformation of commercialization the legal mechanism of universities' R&D results
<b>Organizational and economic</b>	Underdeveloped mechanisms for commercial transfer of research results	Synthesis of economic synergies and institutionalism
<b>Financial</b>	Low diversification of funding sources; lack of financial autonomy for universities	Development of integrated financing model of higher education
<b>Technical</b>	Outdated equipment for auditoriums and research laboratories; underdeveloped elements of innovation and information infrastructure	System-synergetic approach
<b>Coherence problems</b>	Lack of effective motivational mechanisms for cooperation of economic entities in the fields of higher education, science, innovations	Development of a model for achieving positive synergistic effects in modernization of the higher education system; institutional approach to intensification of cooperation between entrepreneurs and educational sectors
<b>Globalization problems</b>	Low ranks of the national higher education system in the global market for educational services	Structural and functional approach

Source: compiled by the authors

The research showed the imperfection of the institutional environment of modernization of the national higher education system, which is caused by a number of factors: 1) obsolescence of formal institutions (inconsistency with the current realities of becoming an information economy); 2) incomplete observance of intellectual property rights); 3) underdevelopment of informal institutions (low level of activity of the public sector in the development of higher education, innovative culture and trust in society); 4) the existence of institutional pitfalls in the development of the system (corruption trap; trap of disproportionate labor market and unfair competition); 5) inefficiency of state regulation institutions and their excessive bureaucracy; 6) the declarative nature of the declared financial autonomy of universities.

The above mentioned necessitates the transformation of the institutional order of modernization of the higher education system in the conditions of the information economy on the principles of transparency, logic, validity, clarity and comprehensibility. Such transformations should be based on the intensification of cooperation between higher education institutions and the business sector. We can distinguish the educational and research vectors of such cooperation, which is manifested in the establishment of partnerships between universities and business in the processes of training for the national economy (matching business requests to competences, skills, graduates, their ability to learn throughout life, entrepreneurship, innovation) and joint research (coordination of research topics to enhance their practical value, investment attractiveness and further transfer and commercialization of the results obtained in the real sector of the national economy).

**Conclusions.** In the course of the research, the necessity of forming a motivational field of intensification of cooperation of higher education and business was substantiated, which was proposed to be implemented on the basis of adaptation of the tried-and-tested University-Industry model to domestic socio-economic realities. This will help narrow the gap between university education, science and the real economy by improving communication links between universities and partner businesses, as well as introducing a nationwide incentive system for businesses. The following incentives are



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**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**


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attributed to the author: targeted tax breaks for start-ups that perform research activities; partial exemption from social security contributions; accelerated depreciation of equipment involved in research; preferential conditions for the use of innovative infrastructure objects; special conditions for using the rights to patented research results, etc. Outlined will allow to ensure the long-term and systematic interaction of subjects of the business sector and higher education institutions in the information economy and prevent fragmentation of these processes, will help to stimulate the innovative development of the national economy by promptly commercializing innovative results of scientific research into enterprises.

Increasing the level of adaptability of higher education institutions to the new conditions of informatization of the national economy requires, in our opinion, improvement of approaches to state regulation of the higher education system. The authors identified the priority measures of state regulatory:

- stimulation of development of innovative, research and educational activity of universities;
- guaranteeing respect for intellectual property rights;
- development of cooperation between universities and enterprises;
- increased support for innovatively active economic entities;
- enhancing the investment attractiveness of education and science;
- increase in the inflow of private investment in the development of information and innovation infrastructure;
- accelerating the pace of commercialization of the results of research in higher education institutions;
- improving the quality of educational services;
- increasing the amount of investments in the upgrading of the educational and research facilities;
- increasing the pace of implementation of the innovative information and communication technologies;
- development of digital literacy of the young population, etc.

Enhancing the cooperation of higher education institutions, business and public sector entities and the public will help to achieve positive synergies, which include: synergies of scale (by pooling potentials and reconciling the activities of multiple entities); multiplier synergy (extended range of beneficiaries of such effects); innovative synergy (the generation of innovative ideas with their further commercialization into the practice of business entities); marketing synergy (promotion of university services in the business environment); investment synergy (increased inflow of private investment in education and science, diversification of sources of funding for universities); management synergy (improvement of approaches to university management, implementation of managerial and organizational innovations); synergy of innovative infrastructure (opportunities to use innovative infrastructure of partners); synergy of social capital (obtaining by members of society socio-economic effects from partnerships of subjects of the main sectors of the national economy).

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**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

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**ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ**

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