

International Competitive Disposition of National Higher Education Systems

LARYSA ANTONYUK,
DENYS ILNYTSKYI,
DMYTRO BARABAS,
MARIYA SANDUL¹

ABSTRACT. In this paper, the stratification of national systems of higher education in a dynamic competitive environment, which is one of the ways of deepening the asymmetries of global economic development, is examined. Governments of key innovation countries, responding to global challenges, place considerable emphasis on increasing the competitiveness of national systems of higher education as generator of the competitive advantages of international economic relations, which are denominated in the form of intellectual capital. The evolution of paradigms of higher education, determinants, criteria and indicators of evaluation, methods of classification and research of the competitiveness of higher education systems are investigated to identify the international competitive disposition of national higher education systems. The stratification of countries is carried out according to the level of competitiveness of national higher education systems which is supported by their positioning in the system of quality coordinates, coverage with higher education and intensity of use, the construction of competitive maps of the global educational market, cluster analysis. Indicators of quality of higher education systems, which are the components of global competitiveness index, and the indicators for ranking the national systems of higher education are the basis for constructing competitive maps. Based on the analysis of competitive maps, the dynamics of positions of the countries are identified and the feasibility of their division into four groups is substantiated. It was found that the grouping of countries and their key characteristics correspond to the levels of development inherent in the paradigms Education 1.0 – Education 4.0. Four types of competitive disposition of national education systems have been identified: leadership, strong, weak and outsider, each having its own peculiar features. The expediency of grouping national systems of higher education into intermediate, transition subgroups, which are distinguished from one to three. It is discovered that each of the methods of grouping countries has drawbacks and advantages, so different ones can be applied depending on the objectives of stakeholders.

¹ **Larysa Antonyuk** – Doctor of Economics, Professor, Vice-Rector for Scientific Research at SHEE “Kyiv National Economic University named after Vadym Hetman”. The author of over 120 works, including 27 of educational and methodical character. The author and co-author of 13 monographic studies. Sphere of scientific interests: competitiveness of the national economy, venture capital, university education, socio – economic entrepreneurship. E-mail: antoniuk@kneu.edu.ua.

Denys Ilnytskyi – Doctor of Economics, Professor at the Department of International Economics at SHEE “Kyiv National Economic University named after Vadym Hetman”. The author of over 120 works, including 10 of educational and methodical character. The author and co-author of 11 monographic studies. Sphere of scientific interests: knowledge economy, global scientific and educational space, information resources, intellectual property, European integration. E-mail: ilnitskyd@gmail.com.

Dmytro Barabas – Candidate of Economic Sciences, Associate Professor at the Department of Management at SHEE “Kyiv National Economic University named after Vadym Hetman”. The author of over 90 works, including 7 course books. The co-author of several monographic studies. Sphere of scientific interests: enterprise competitiveness management; current concepts of business efficiency; competitiveness of educational systems. E-mail: barabas@kneu.edu.ua.

Mariya Sandul – postgraduate at the Department of International Economics at SHEE “Kyiv National Economic University named after Vadym Hetman”. Sphere of scientific interests: national higher education systems, determinants of the competitiveness of higher education systems, current trends in the global academic environment. E-mail: mary_sandul@ymail.com.

IEP, № 27, (2017) pp. 7–38

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ISSN 1811-9832/2017/№ 2 (27)

It is revealed that the identification of positions of the higher education system of Ukraine, as well as other countries, depends on the chosen system of indicators and demonstrates the possibility of its classification both as a country with strong competitive positions, and a country with outsider position. This is typical for countries of transition subgroup. Positive trends in 2017 allowed Ukraine to stabilize its positions in the global educational space, but did not compensate for the continued decline in key indicators of the higher education system. It is substantiated that in order to increase the competitiveness of the higher education system of Ukraine, it is expedient to implement a targeted development strategy that should integrate the key priorities of reform – the focus of activity on the results, the improvement of the effectiveness of interconnections, the development of business environment and the improvement of quality of the resource base.

KEYWORDS. Education system, cluster analysis, competitive map, classification, stratification, higher education quality, global competition, competitiveness of the higher education system, Ukraine.

Introduction

The urgency of study of the competitive position of national systems of higher education is determined primarily by global challenges, such as: firstly, the intensification of competition, the emergence of new subjects of the world educational market; secondly, the increase in requirements of the labour market for the quality of higher education; thirdly, the development of systems and technologies that alter the methods for creating, fixing and transferring knowledge and skills as a result of the fourth industrial revolution; fourthly, the perception of education in key innovation countries as intangible investment assets; fifthly, the lack of funding of national education systems; sixthly, the ineffectiveness of traditional forms of management. The study of various aspects of the competitiveness of national higher education systems is currently relevant both in terms of identifying its key determinants and in developing effective educational policies, and in terms of forecasting future economic development of countries and their global competitive leadership.

The quality of higher education plays a special role in the system of managing the international competitiveness of national education systems while implementing educational policies. The quality management of any organization evolves towards the formation and development of a business management excellence model² that is an important factor in managing the international competitiveness of national education systems. Trends in the development of national and international quality assurance systems of higher education include:

- internationalization in the field of quality assurance of higher educations;

² The most common of them in the world are the Baldrige, EFQM and KAIZEN models.

- distribution of multi-parametric rating systems of higher education;
- decrease of confidence in educational institutions regarding their ability to ensure the quality of higher education;
- distribution of the accreditation tool in higher education;
- increasing attention to risk management, direct and indirect learning outcome;
- increasing role of internal quality assurance and institutional quality culture;
- specialization and merging of agencies in the field of higher education quality assurance.

The need to reform the education system of Ukraine, including the system of higher education, in its relationship with other elements of the economy is among the topical challenges of socio-economic development. It should rely on the study of other countries experience and its creative application in domestic conditions. We put forward the hypothesis that the deployment of global competition of national education systems and the significant efforts of key innovation countries aimed at developing competitive positions lead to an increase in the asymmetries of global economic development and stratification of national systems of higher education. That is why it became important and makes the scientific and practical task of identifying the disposition of countries according to criteria and indicators that shape the competitiveness of national education systems.

The lagging behind of Ukraine in global ratings, in particular the global competitiveness rating, including to a group of countries with low income level per person, the active reform of education systems of developed countries and the desire to qualitatively improve the current state led to the adoption of a number of laws aimed at structural changes in higher education. Awareness of the importance of higher education system, as the key generator of intellectual capital, makes it necessary to take into account the best practices in developing a strategy to increase its international competitiveness.

Problematic situation

The extended shortage of resources directed to the development of national system of higher education has led to a reduction in the efficiency of its activities and the formation of a gap between its quality and resulting impact on socio-economic development. It is complemented by insufficient analysis of the achievements of world science and the practice of developing national educational models and implementation of strategies for increasing the efficiency of using available resources with the transition to an expanded reproduction of

educational system. The stratification of national education systems at a competitive level is a process that requires critical analysis and has long-term effects on national economies, which is especially important in the modern period of knowledge economy formation. Clear identification of countries in a certain area (in our case, the global scientific and educational space) will help to build priorities and reveal key vectors for improving the competitiveness of higher education system in Ukraine. This will contribute to the realization of national economic interests, and the tested method can be extended to other areas.

The purpose of this work is to test the hypothesis of deepening the stratification of national education systems in terms of competitiveness, with the subsequent identification of groups of countries in the global scientific and educational space. To achieve the goal, the following main tasks were identified: to identify the main components of the competitiveness of national higher education systems; to identify and analyse the disposition of national education systems; to determine the place of Ukraine in the global scientific and education space and to develop recommendations for improving the competitiveness of the national higher education system. The subject of study is the patterns of stratification of national education systems by the level of competitiveness.

Overview of research methods and their results. The study of peculiarities of the development of national systems of higher education, the identification of global trends and challenges is most often carried out in the work of experts from the UN, UNESCO, the World Bank, the OECD or the WEF, but most of them do not pay much attention to the market, the competitive nature of relationship that is inherent in the modern global scientific and educational space.

An analysis of scientific works that highlights the concept of competitiveness of national higher education systems showed that the scientific community has not yet proposed a clear definition. In general, it is possible to distinguish several basic theoretical approaches to the study of competitiveness of higher education systems: from the point of view of the system of higher education as a unique organizational structure (S. Marginson³), as an element of the national innovation system (G. Itskovits, E. Carayanis^{4,5}), as a dynamic and evolving network system (J. Langel, A. Garcins, V. Moravits^{6,7,8}) as a specific

³ Marginson, S. "Living with the Other: Higher education in the global era". *International Higher Education. Monash Centre for Research in International Education, Australian Universities' Review*42 (2000): 5–8.; Marginson, S. "Dynamics of national and global competition in higher education". *Higher Education*52 (2006): 1–9.

⁴ Etzkowitz, H. *Troinaya spiral: Universitety – predpriyatiya – gosudarstvo. Innovacii v deistvii*: Monographiya-Per. s ang. Pod.red. A.F. Uvarova. Tomsk: Tom.Gos un-t system uprav. I radioelektroniki, 2010.

⁵ Etzkowitz, H. and L. Leydersdorf. "The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations". *Research Policy*29 (2000): 109–23.

⁶ Lengel, J. *Education 3.0: Seven Steps to Better Schools*. Teachers College Press, 2013. <http://www.utcc.ac.th/news/pdf.php?type=4&id=3887>.

branch of market economy (F. Altbach, M. Bastedo, M. West, P. Humpor^{9;10;11}) as a complex subject of the world economy (J. Salmi, R. Williams, G. de Rassenfus¹²), etc. Competitiveness of national systems of higher education is often analysed through the prism of their social functions (P. Ederer, F. Schuller, S. Willms¹³), etc. Moreover, as it is proven by M. Stoneken, R. Matkevichen, and E. Weiginen¹⁴, the dominant multi-dimensional approach to determining the sector of higher education, leads to the emergence of new integrated, inter-and multi-disciplinary studies to assess its competitiveness. The international ranking of universities and educational systems has become widespread, which is considered to be the main instrument for measuring competitiveness in higher education. The creation of modern methods of international comparisons and conducting evaluations of the effectiveness, competitiveness of national systems of higher education or its individual elements are developed in the works of such researchers as P. Ederer, F. Schuller, S. Willms¹⁵, R. Williams, S. Marginson¹⁶, M. Martin¹⁷, P. Evans¹⁸, K. Schwab¹⁹, K. Sala-i-Martin, B. Lanvin, S. Dutta²⁰, R. Florida²¹ and others²².

⁷ Harkins, A. "Leapfrog Principles and Practices: Core Components of Education 3.0 and 4.0 / A. M. Harkins". *Futures Research Quarterly Draft VIII*, 2008: 1-15. Mode of access: <http://leapfrog.umn.edu/Documents/HarkinsCoreComponents.pdf>.

⁸ Moravec, J. *Moving beyond Education 2.0*. Education Futures, 2008. <http://www.educationfutures.com/2008/02/15/movingbeyond-education-20/>.

⁹ Altbach, P., Reisberg, L. and L. Ruml. *Trends in Global Higher Education: Tracking an Academic Revolution*. UNESCO, 2009. <http://www.researchgate.net/mwg-internal/de5fs23hu73ds/progress?id=C8xL-phfh9SvIF4aej8d0ns6MeEcnXOQzYEQXqO40vI,&dl>

¹⁰ Bastedo, M. Altbach, P. and P. Gumpert. *American Higher Education in the 21st century: Social, Political, and Economic Challenges*. Baltimore: Johns Hopkins University Press, 2016.

¹¹ West, M. "Education and Global Competitiveness" *Issues in Science & Technology* 3 no. 28 (2012): 37-44. <http://nrs.harvard.edu/urn-3:HUL.InstRepos:9544459>.

¹² Williams, R., Marginson, S., Jensen, P. and G. de Rassenfosse. *U21 Ranking of National Higher Education Systems*. Melbourne University, Universitas 21, 2017. <http://www.universitas21.com/RelatedFile/Download/664>

¹³ Ederer, P., Schuller, P. and S. Willms. "University Systems Ranking: Citizens and Society in the Age of the Knowledge". *Lisbon Council, Brussels*, 2008: 28. <https://vo.hse.ru/data/2010/12/31/1208182358/Evrop.pdf>.

¹⁴ Stonkienė, M., Matkevičienė, R. and E. Vaiginienė. "Evaluation of the national higher education system's competitiveness: Theoretical Model" *Competitiveness Review: An International Business Journal* 26 (2016): 116-31.

¹⁵ Ederer, P., Schuller, P. and S. Willms. "University Systems Ranking: Citizens and Society in the Age of the Knowledge". *Lisbon Council, Brussels*, 2008: 28. <https://vo.hse.ru/data/2010/12/31/1208182358/Evrop.pdf>.

¹⁶ Williams, R., Marginson, S., Jensen, P. and G. de Rassenfosse. *U21 Ranking of National Higher Education Systems*. Melbourne University, Universitas 21, 2017. <http://www.universitas21.com/RelatedFile/Download/664>

¹⁷ Martin, M. and C. Sauvageot. *Constructing an indicator system or scorecard for higher education: A practical guide*. International Institute for Educational Planning, UNESCO, 2011.

¹⁸ Lanvin, B. and P. Evans *The Global Talent Competitiveness Index* INSEAD, HCLI and Adecco Group, 2017. http://global-indices.insead.edu/gtci/documents/INSEAD_2015-16_Full_Book_Ebook.pdf.

¹⁹ "The Global Competitiveness Report 2017-2018". *WEF*, 2017. <http://reports.weforum.org/global-competitiveness-index-2017-2018/>.

²⁰ "The Global Innovation Index 2017: innovation Feeding the World". Cornell University, INSEAD, World Intellectual, 2017. <https://www.globalinnovationindex.org/gii-2017-report>.

²¹ Florida, R., Mellander, C., and K. King. "The Global Creativity Index". *Martin Prosperity Institute, Rotman School of Management, University of Toronto*, 2015: 1-64. <http://martinprosperity.org/media/Global-Creativity-Index-2015.pdf>.

In general, the competitiveness of the national higher education system is defined as the aggregate potential of higher education institutions and other institutions operating in the field of higher education and their combined ability to provide high-quality educational and research services that would satisfy both the domestic demand for skilled labour and exceed international standards, forming conditions for the constant increase and realization of this potential in the scale of the global scientific and educational space. At the same time, the latter has not yet formed as a unitary system, but is a complex combination of such components as: global financial flows, knowledge networks and national higher education systems and institutions working at the same time at the local, national and global levels. Moreover, according to a well-known expert in the field of higher education studies S. Marginson²³, relations in this sector are simultaneously based on both competition and cooperation, they are characterized by fruitful mutual influence, persistent differences, and often – similarity in approaches within the country and on the international level.

In our opinion, the competitiveness of the national system of higher education is its ability to effectively meet the needs of state in using the intellectual resource of the nation on the basis of integration of scientific and educational activities, the formation of common civilization values, the cultivation of talents and successful engagement in the global scientific and educational space. Therefore, the competitiveness of a country's higher education system depends on the ability of higher education institutions and other institutions to provide competitive educational services and produce competitive scientific results.

The diversity of levels of development of national systems of higher education is one of the manifestations of asymmetry in the development of economic systems, which is inherent in the global economy. Therefore, the concept of the evolution of higher education systems, which clearly illustrates the transformation of the role and organization of education, deserves special attention: from “Education 1.0.” to “Education 4.0.” (J. Langel²⁴, D. Kits, Ya. F. Schmidt²⁵, J. Moravits²⁶).

²² “QS Higher Education System Strength Rankings”. *Quacquarelli Symonds, Elsevier*, 2016. <http://www.topuniversities.com/system-strength-rankings/>.

²³ Marginson, S. “Dynamics of national and global competition in higher education”. *Higher Education* 52 (2006): 1–39.

²⁴ Langel, J. *Education 3.0: Seven Steps to Better Schools*. Teachers College Press, 2013. <http://www.utcc.ac.th/news/pdf.php?type=4&id=3887>.

²⁵ Harkins, A. “Leapfrog Principles and Practices: Core Components of Education 3.0 and 4.0 / A. M. Harkins”. *Futures Research Quarterly Draft VIII*, 2008: 1-15. Mode of access: <http://leapfrog.umn.edu/Documents/HarkinsCoreComponents.pdf>.

²⁶ Moravec, J. *Moving beyond Education 2.0*. Education Futures, 2008. <http://www.educationfutures.com/2008/02/15/movingbeyond-education-20/>.

The analysis of these stages allows to trace the evolution of concepts of the competitiveness of higher education systems. This step-by-step approach to the analysis of education systems and their role in society is the most logical and coherent, where the system of higher education is considered not in isolation, but in the dialectic of local and global interconnections.

The evolution of higher education paradigm causes a change in the missions of universities and other institutions that make it up (Table 1). For example, the mission of universities is transforming from the creation, accumulation and dissemination of knowledge at the educational level 1.0 into the preparation of systematic and analytical thinking innovators, achieving the goals of sustainable development at the level of education 4.0. Highly competitive universities are already functioning at the level of Education 4.0 paradigm.

It is considered that the most competitive systems of education are of those countries that have a long history of consistent development of higher education and individuals who are constantly improving their practices in this field. A striking example of the key importance of a strong tradition of consistent state support of the educational and research sectors is the United States²⁷. Although the example of Singapore proves that it is possible to reach a high level of competitiveness in a shorter time frame.

However, one focus is not enough, therefore, as M. Porter argues, competitive higher education systems are also characterized by the presence of corporate academies and the relative openness of the country's immigration policy towards skilled staff²⁸. These views are elaborated by P. Ederer, S. Willms and F. Schuller²⁹, who, according to the results of study of higher education systems in 17 OECD countries, identified the following common features:

- the orientation of the system of higher education primarily on the learning process;
- the ability to offer broad opportunities for as many people as possible;
- openness of competition in the national system of higher education;
- sensitivity to the needs of labour market;
- exceeding the reach of local communities, attracting the best international talent.

²⁷ Friedman, T. and M. Mandelbaum. *That Used to Be Us: How America Fell Behind in the World It Invented and How We Can Come Back*. Farrar, Straus and Giroux. – New York, 2011.

²⁸ Porter, M. *Konkurency ya*. [per. s angl.]. M.: Y`zdatel`sky`j dom «Vy`l`yams», 2006. [In Russian]

²⁹ Ederer, P., Schuller, P. and S. Willms. "University Systems Ranking: Citizens and Society in the Age of the Knowledge". *Lisbon Council, Brussels*, 2008: 28. <https://vo.hse.ru/data/2010/12/31/1208182358/Evrop.pdf>.

Table 1 Evolution of Higher Education Paradigm³⁰

Key dimensions	Education 1.0	Education 2.0	Education 3.0	Education 4.0
<i>Mission</i>	<ul style="list-style-type: none"> • providing system standardized knowledge; • mass nature of education; • conducting episodic fundamental research 	<ul style="list-style-type: none"> • providing specialized knowledge and skills, raising the level of funding and quality of education; • carrying out of applied researches 	<ul style="list-style-type: none"> • providing high-quality educational services; • conducting joint research with industry and government 	<ul style="list-style-type: none"> • providing global competencies³¹ and skills; • learning is based on research, participation in innovation processes
<i>Place of study</i>	specially designated study facilities	training rooms, online platforms	training rooms, online platforms	global network
<i>Learning technology</i>	technologies are almost not used	occasional use of technology, the Internet	active use of technology, the Internet	tight integration of technologies ³² and their daily modification
<i>Methods of training</i>	from the teacher – to the student, memorization	educational dialogue, diversification of the educational process	knowledge sharing, education throughout life	joint development of innovations, continuous education
<i>Results of the educational process</i>	Graduates are focused on performing professional functions	Graduates have the necessary competencies	Graduates have critical thinking and entrepreneurial skills	Graduates are capable of creativity, innovation and their commercialization

In the process of identification of the determinants of competitiveness of national systems of higher education, the researchers³³ adapted the rhombus of M. Porter to assess the competitiveness of national higher education systems. The adapted model shows that the development and efficiency of the national higher education system are deeply integrated into a multi-component network. In this model, the government is seen as a key partner in the higher education system, which depends on government policies and strategies. The internal factors in the system of higher education are:

³⁰ Compiled by the authors: Harkins, A. "Leapfrog Principles and Practices: Core Components of Education 3.0 and 4.0 / A. M. Harkins". *Futures Research Quarterly Draft VIII*, 2008: 1-15. Mode of access: <http://leapfrog.umn.edu/Documents/HarkinsCoreComponents.pdf>.

³¹ Particularly about the competencies of the XXI century, known as 4K – creativity, critical thinking, communication and co-operation.

³² In particular digital and telecommunication

³³ Stonkienė, M., Matkevičienė, R. and E. Vaiginienė. "Evaluation of the national higher education system's competitiveness: Theoretical Model" *Competitiveness Review: An International Business Journal* 26 (2016): 116–31.

- factors of production (resources and competencies, university status, geographic location, demographic factors, as well as infrastructure development, specialization factors, international cooperation of universities, participation in research networks, international educational contracts, attraction of foreign students, scientists and researchers);
- conditions of demand for results (quality of graduates competence formed, market interest in research, conformity of results to needs of social development);
- structure, financing and management in the system of higher education;
- accountability, accreditation, assessment in the higher education system.

Recognition of the value of academic capital and investment in its development is considered a key indicator of global competitiveness and success of the country. As a rule, developed state policy in the field of higher education concentrates on the development of research universities and their transformation into world-class universities, therefore, the initiatives to create world-class universities have been introduced in many countries around the world (France, Germany, the Russian Federation, Spain, Singapore, South Korea, Taiwan, Malaysia, Finland, India, Vietnam, Latvia, etc.). In contrast, in a number of countries (Ireland, Australia, Norway), the focus is on the importance of building a world class higher education system. In addition, countries are faced with the choice of a neoliberal or socio-democratic model of development of the higher education system³⁴.

An important factor of the competitiveness of education system is the effectiveness of investment model in its development. There are different approaches (instrumental, utilitarian, reductionist, etc.) in academic discussions about which system of investing in higher education is the best. Researchers note³⁵ that the quality of teaching, the number of students and the competitiveness of higher education system as a whole depend on the choice of investment model to a large extent.

The World Bank experts note³⁶ that even though there is a competition between higher education institutions and other public sector institutions for financing from the state budget, funding of higher education remains important for three reasons: investments in higher education create benefits from the point of view of economic and social

³⁴ Hazelkorn, E., Wells, P. and Marope, M. (eds). *World-Class Universities or World Class Systems? Rankings and Higher Education Policy Choices*. Rankings and Accountability in Higher Education: Uses and Misuses. UNESCO, Paris, 2013: 1-23. <http://www.unesco.org/library/PDF/Hazelkorn2013.pdf>.

³⁵ Kabók, J., Kis, T., Csüllög, M., and I. Lendák. "Data Envelopment Analysis of Higher Education Competitiveness Indices in Europe". *Acta Polytechnica Hungarica*10, no. 3 (2013): 185-201.

³⁶ "Constructing Knowledge Societies: New Challenges for Tertiary Education". *Washington: The International Bank for Reconstruction and Development*. http://www.worldbank.org/.../Constructing_Knowledge_Societies.pdf.

development; market failures significantly affect the inaccessibility of loans to some students; higher education is essential for the development of primary and secondary education.

There are quite few international university rankings, but there is a limited number of ratings for national education systems (Table 2).

Table 2 Key Research on Competitiveness of National Higher Education Systems³⁷

No.	Research title	Authorship	Year, periodicity	Brief description
1.	Ranking of higher education systems: citizens and society in the era of knowledge	P. Ederer, F. Schuller, S. Willms	2009	Study of 17 OECD countries, based on 6 criteria: coverage, accessibility, efficiency, attraction, age range, flexibility of higher education systems.
2.	Ratings of National higher education systems Universitas 21	R. Williams, S. Marginson et al. (Universitas 21)	since 2012 – annually	Comprehensive evaluation of 50 countries based on 4 groups of criteria: resources, interconnections, environment, results.
3.	Global Competitive Talent Rating	B. Lanvin, P. Evans (INSEAD, HCLI and Adecco Group)	since 2013 – almost annually	Comparison of the effectiveness of educational systems of countries and their policies in the field of human resources and intellectual capital.
4.	The index of education systems effectiveness	P. Dolton et al. (GEMS Education Solutions)	2014	Evaluating the efficiency of public investment in educational systems in general, and not separately in higher education.
5.	Rating of higher education systems power QS	Quacquarelli Symonds	since 2016 – annually	Based on the analysis of only top universities of countries according to 4 criteria (systemic potential, access, efficiency of flagship universities, economic context).

³⁷ Compiled by the authors: Florida, R., Mellander, C., and K. King. “The Global Creativity Index”. *Martin Prosperity Institute, Rotman School of Management, University of Toronto*, 2015: 1-64. <http://martinprosperity.org/media/Global-Creativity-Index-2015.pdf>; Ederer, P., Schuller, P. and S. Willms. “University Systems Ranking: Citizens and Society in the Age of the Knowledge”. *Lisbon Council, Brussels*, 2008: 28. <https://vo.hse.ru/data/2010/12/31/1208182358/Evrop.pdf>; Williams, R., Marginson, S., Jensen, P. and G. de Rassenfosse. *U21 Ranking of National Higher Education Systems*. Melbourne University, Universitas 21, 2017. <http://www.universitas21.com/RelatedFile/Download/664>; “The Global Competitiveness Report 2017–2018”. *WEF*, 2017. <http://reports.weforum.org/global-competitiveness-index-2017-2018/>; Lanvin, B. and P. Evans *The Global Talent Competitiveness Index* INSEAD, HCLI and Adecco Group, 2017. http://global-indices.insead.edu/gtci/documents/INSEAD_2015-16_Full_Book_Ebook.pdf; Dolton P. The Efficiency Index [Electronic resource] / P. Dolton, O. Marcenaro-Gutiérrez, A. Stil // GEMS Education Solutions. – 2014. – Mode of access: http://www.edefficiencyindex.com/book/files/assets/common/downloads/The_Efficiency_Index.pdf; *QS Higher Education System Strength Rankings* [Electronic resource] // Quacquarelli Symonds, Elsevier. – 2016. – Mode of access: <http://www.topuniversities.com/system-strength-rankings/>.

No.	Research title	Authorship	Year, periodicity	Brief description
Study of higher education as part of more complex ratings:				
6.	- Global Competitiveness Ranking	K. Schwab, K. Sala-i-Martin et al. (WEF)	since 2004 – annually	The most comprehensive global competitiveness study of countries includes 113 indicators; education is one of 12 groups of criteria.
7.	- the global index of innovations	S. Dutta, B. Lanvin et al. (INSEAD, WIPO)	since 2009 – annually	Research of the innovation competitiveness of countries; education is included in the sub-index of the cost of innovation.
8.	- the global index of creativity	R. Florida, S. Mellander, K. King (Martin Prosperity Institute)	from 2004, 2011, 2015.	Investigates 139 countries based on three criteria: "technology", "tolerance", "talent", which includes the coverage of population with higher education.

This is conditioned not only by the complexity of implementation of such task, but also by the inappropriate application of other criteria and indicators. From our point of view, the most successful are the Universitas-21 rating and the ranking of higher education systems within the Global Competitiveness Index of countries.

The assessment of competitiveness of national higher education systems is a rather complex process, which is caused by a significant number of factors influencing their competitiveness, organizational, financial and managerial differences between education systems of different countries, as well as the complexity of obtaining reliable data. The first of the above studies was conducted for international comparisons of the readiness of higher education systems to respond to the challenges of today's society and the needs of knowledge society and was based on an analysis of 17 countries in terms of the six criteria:

- coverage (the proportion of university graduates in a country that can theoretically claim higher education obtaining);
- accessibility (comparison of countries according to the level of training of university applicants entering the university);
- efficiency (average wage advantage of a university graduate);
- attractiveness for international students (the share of international students);
- age range (the number of students aged 30-39 at the higher education institution);
- flexibility (the speed of implementation of the criteria set out in the Bologna Declaration).

The method of determining the competitiveness of national higher education systems Universitas 21³⁸ is of special consideration. The methodology is based on 4 groups of indicators that assess resources, environment, interconnections and performance (Table 3). Although the overwhelming proportion of indicators is quantitative, this rating is the most comprehensive attempt of an international comparative study of higher education systems. By the tool of regression analysis, the authors of the ranking found that the variation of results is on s explained by input, while the effect of resource indicators is somewhat higher than the effect of indicators of the environment. In addition, the research funding and the regulatory environment also account for 75% of the impact on research performance.

Table 3 Indicators of Higher Education Systems Competitiveness Assessment According to Universitas 21³⁹

Group	Indicators (share in total ranking)
Resources (20%)	Government expenditures on higher education,% of GDP (5%)
	Total expenditures on higher education,% of GDP (5%)
	Annual expenditures per student in higher education, USD according to PPP (5%)
	Expenditures of higher education for R&D, per capita, USD according to PPP (2.5%)
	R&D expenditure in higher education,% of GDP (2.5%)
Medium (20%)	The share of female students in the total number of higher education applicants (1%)
	The share of female academic staff in higher education sphere (2%)
	Data quality rating (2%)
	Qualitative indicator of political and legal environment (10%)
	Results of the WEF survey as far as the education system in the country meets the needs of a competitive economy (5%)
Interconnections (20%)	Share of foreign students in higher education (4%)
	Share of articles published in co-authorship with foreign colleagues (4%)
	Number of articles in open access (per capita) (2%)
	External requests for university websites by third parties (per capita) (2%)
	Answers to the question of how well is the transfer of knowledge between universities and companies developed (4%)
	Share of publications of academic staff in co-authorship with industry (4%)

³⁸ Universitas21 – is a worldwide network of research universities of the XXI century, an organization founded in Melbourne (Australia) in 1997, main objective is to strengthen cooperation between world's research universities and the formation of an advanced scientific community in the field of higher education at the global level.

³⁹ Compiled by the authors: Williams, R., Marginson, S., Jensen, P. and G. de Rassenfosse. *U21 Ranking of National Higher Education Systems*. Melbourne University, Universitas 21, 2017. <http://www.universitas21.com/RelatedFile/Download/664>

Group	Indicators (share in total ranking)
Results (40%)	Total number of articles published by higher education institutions (10%)
	The total number of articles per capita (3%)
	Average impact of articles (5%)
	Number of world class universities (3%)
	University perfection (7%)
	Attracting the population of corresponding age group to higher education (3%)
	Share of people aged 25-64 with higher education (3%)
	Number of researchers per capita (3%)
	The unemployment rate among those aged 25-64 who have higher education, compared with the unemployment rate among those who do not have higher education (3%)

Mapping the world of educational space⁴⁰, which is practiced on various grounds, has not yet become a traditional tool for studying higher education systems. Among the examples of their application, the most popular indicators are the quality of education and the number of foreign students, for example, as suggested by Y. Kettunen⁴¹. By grouping countries by the number of students or by any single indicator, we consider it sufficient to use a simple ranking of indicators, which makes it possible to identify those which have their greatest, medium or small values, but competitive maps demonstrate them dynamically. On the other hand, the grouping of countries became widespread based on the ranking of education systems that take into account a large number of criteria. Also, different approaches to mapping remain in use by mapping indicators or using different colours to display the level of a specific indicator that is specific to certain countries.

To stratify countries, experts from the World Economic Forum (WEF) propose to divide countries into 3 key development groups: countries that are in Phase 1 (Resource-driven countries), Phase 2 (Performance-driven countries), and Phase 3 (Innovation-driven countries), as well as two transition groups from first to second and from second to the third⁴². They also include Ukraine to the transition group (from the first to the second phase), which in 2017 ranked 81st out of 137 countries in terms of competitiveness of the national economy. At the same time, WEF experts, relying on the World Bank's division of countries by income per capita⁴³, rank Ukraine at the highest

⁴⁰ Depending on the context, it is expedient to use the categories "space" or "market".

⁴¹ Kettunen, J. "Strategy and Quality Maps in Higher Education". *US-China Education Review* 8 no. 2 (2011): 149-56.

⁴² "The Global Competitiveness Report 2017-2018". *WEF*, 2017. <http://reports.weforum.org/global-competitiveness-index-2017-2018/>.

⁴³ Low-income countries (less than \$ 1005), lower-middle income countries (US \$ 1006-3995), countries with higher incomes than the average (US \$ 3996-12235), high-income countries (higher USD 12236).

24th place in the world in terms of human capital development⁴⁴. Therefore, on the example of Ukraine we observe considerable asymmetries in the competitive disposition of countries depending on the chosen system of indicators and methods of their analysis.

Romanian researchers, based on the analysis of REFLEX and HEGESCO databases⁴⁵, distinguish three types of national education systems and related educational programs, namely: countries with high commitment to education (Hungary, Norway); countries with an average professional orientation of educational programs (Belgium, Netherlands, Germany, Poland, Portugal, Czech Republic); countries with low professional orientation of educational programs (Great Britain, France, Italy, Lithuania)⁴⁶. However, such studies typically cover limited groups of countries and are of sporadic character, which makes it impossible to consider them as a reliable and consistent source of similar data and its dynamics. In addition, the professional orientation of educational programs or any other distinct indicator can not be regarded as the only sign that classifies education systems.

When classifying national education systems one can also rely on the typology of education programs, the development of which, as the ideas of L. Aron and M. Reyvid, was proposed by Y. Ricks and P. Twinning⁴⁷, which is based on the classification of educational programs based on 9 types of signs who, where, what, how, when and which. On this basis, it is possible to systematize countries in terms of the depth of diversification, the variety of educational programs they offer. On this basis one may include the United States to the world leaders, where the system of higher education includes more than 7 thousand diverse institutions that occupy the most diverse niches of educational market. However, from a practical point of view, such a task may be an excessive burden for researchers and will require significant organizational and analytical efforts. In terms of a particular field of knowledge or field of activity, such task can be relevant and easier to implement. Similar thoughts were expressed by S. Bulter and B. Buckley⁴⁸, who emphasized the individual niches of the scientific and educational market.

⁴⁴ “The Global Human Capital Report 2017”. WEF, 2017. <https://weforum.ent.box.com/s/dari4dktg4jt2g9xo2o5pkspjpatvawdb>

⁴⁵ REFLEX – employment and professional flexibility research; HEGESCO – Higher Education as a Strategic Competency Generator.

⁴⁶ Lungu, E.-O., Zamfir A.M. and M.M. “Matei. Patterns on the vocational specificity of the higher educational programmes”. *Procedia – Social and Behavioural Sciences: 2-nd Cyprus International Conference on Educational Research* 89 (2013): 949 – 53.

⁴⁷ Rix, J. and P. Twining. Talking about schools: Towards a typology for future education”. *Educational Research* 4 no. 48 (2007): 329–41.

⁴⁸ Boulter, C.J. and B.C. Buckley *Constructing a Typology of Models for Science Education* / In: Gilbert J.K., Boulter C.J. (eds) *Developing Models in Science Education*, 2000. – Springer, 41-57.

Another possible approach to the stratification of national educational systems is a set of techniques⁴⁹ that, recognizing the decisive influence of achievements of Western civilization, classify countries according to the level of literacy of the population, the level of demonstrations by students and pupils of competencies when conducting international comparisons, assessments of the world labour market or international quality of graduates. Its advantages include the fact that it is one of the few which has found practical mass introduction. However, one should be aware of its shortcomings. Thus, the level of literacy of the population can only be used to analyse the long-term dynamics of educational environment in the country; the level of competence of students is measured no more than once every four years in a limited group of countries; assessments of the labour market are most closely related to the ranking of universities, which has a strong subjective basis.

Speaking about the competitiveness of the types of higher education systems one should mention the basic functions of Newman that are carried out by them: 1) socialization of youth to society (socialization in the community, socialization to thought and socialization in the profession); 2) promoting social mobility⁵⁰. Therefore, countries can be classified according to the level of performance of these functions, but the problematic issue is the difficulty of obtaining objective data from higher education systems and measuring of efficiency.

The concept of triple spiral that examines the competitiveness of education systems from the point of view of the effectiveness of interinstitutional cooperation between the state, enterprises, universities and public organizations has become widespread. This made a possibility to distinguish between three main models of interaction between the authorities and institutions of higher education – the model of state control with effective and systematic public administration of higher education (France, Germany, Scandinavian countries), the so-called Anglo-Saxon model – a model of state supervision with lesser state intrusion and greater decentralization and institutional autonomy (Great Britain, the USA), and the state intervention model, which is often non-systemic, is subject to the priorities of current situation (Southern Africa, most developing countries)⁵¹. It should be admitted that in the pure form the model can be identified not so often, and in most cases they will be combined. In developing countries, depending on the dominant source of funding for national systems of higher education,

⁴⁹ Grigorenko, E. L. "Hitting, Missing, and in between: A Typology of the Impact of Western Education on the Non-Western World". *Comparative Education* 43, no. 1 (2007): 165–86.

⁵⁰ *The State, the Market, and Higher Education: Challenges for the New Century* / Marek Kwiek (ed.), The University, Globalization, Central Europe. – Frankfurt-on-Main – New York: Peter Lang, 2003.

⁵¹ *Institutional Research in South African Higher Education. Intersecting Contexts and Practices* / Editors: Botha, J., Muller N.J. – 2016. – SUNMEDIA. – PP.192-196.

they are also distinguished by their respective types (government, private, foreign aid, mixed)⁵².

Active reformation of educational systems, constant changes in the external competitive environment of their development require a dynamic identification of the disposition of national educational systems. It is possible both as a separate absolute indicators by drawing up market maps or as qualitative features, for example, one can attribute the degree of autonomy, openness, quality and transparency of scientific and educational institutions.

The mutual influence of economic development of countries and the quality of higher education shows a rather high correlation coefficient between them (0.73). Highly developed countries are characterized by the highest quality of higher education, and the highest coverage of the population with higher education. High variation is typical only for a group of countries with a lower income average, partly due to their heterogeneity in terms of economic development. Low-income economies find it more difficult to finance higher education systems, since in most of them the total cost of a university student (as % of GDP) is significantly higher than that of developed countries, but in absolute terms (USD), educational systems of these countries receive insufficient financing (fig.1-2).

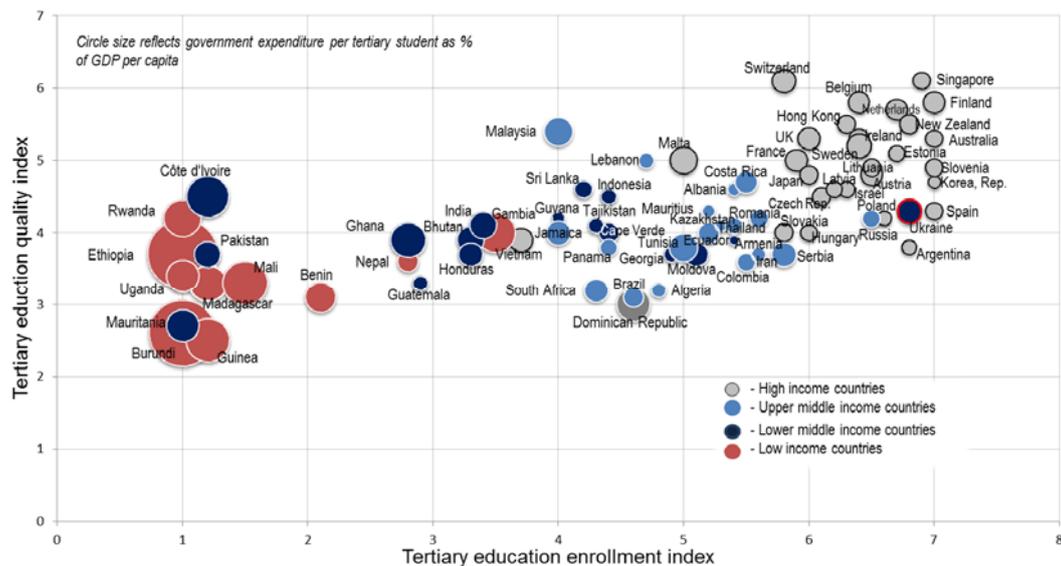


Fig. 1. Country Disposition in the System of Quality Coordinates, Coverage of Higher Education and Expenses per Student as a Share of GDP in 2016⁵³

⁵² Masino, S. and M. Nin˜o-Zarazua. "What works to improve the quality of student learning in developing countries?" *International Journal of Educational Development* 48. (2016): 53-65.

More than 10 years ago, scientists proved that popularization of rating of universities would help to systematize the global university market in one hierarchical list, which, on the one hand, will allow international comparisons, and on the other hand, will lead to an aggravation of competitive pressure⁵⁴.

However, the compilation of rating lists is not without disadvantages, since it will primarily concern one of the university models – integrated research and intensive universities that subject their activities to science. But even in Europe one can build a whole typology of scientific and educational institutions⁵⁵. Another disadvantage is that world ratings concern primarily English-speaking universities. Rating of higher education systems is devoid of these disadvantages.

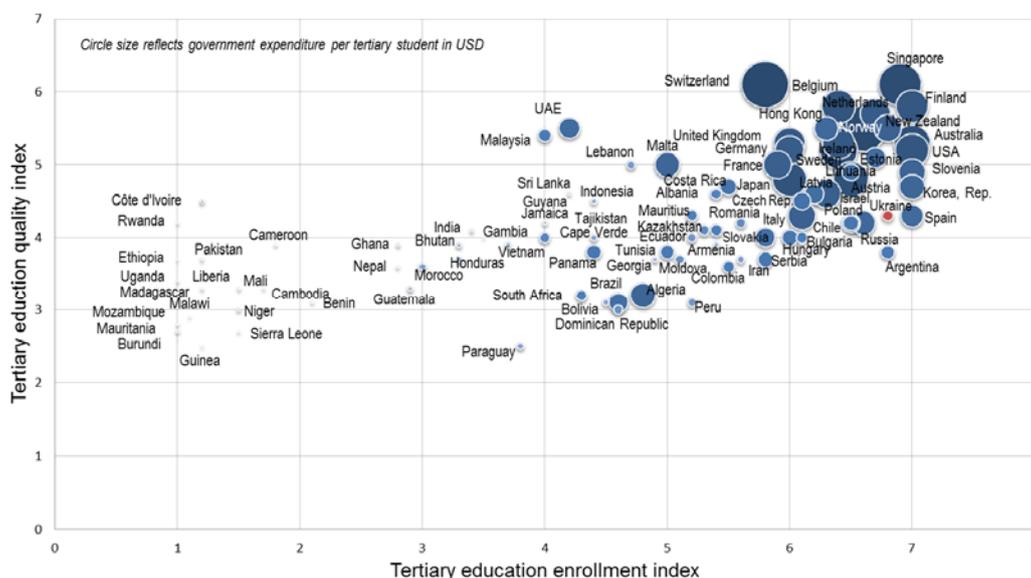


Fig. 2. Country disposition in Quality Coordinate System, Coverage of Higher Education and Expenses per Student in USD in 2016⁵⁶

⁵³ Compiled by the authors: “The Global Competitiveness Report 2017–2018”. *WEF*, 2017. <http://reports.weforum.org/global-competitiveness-index-2017-2018/>; “Education Indicators” *UNESCO Institute for Statistics*, 2016. <http://data.uis.unesco.org/index.aspx?queryid=189>.

⁵⁴ Marginson, S. and Van Der Wende, Marijk. “To rank or to be ranked: The impact of global rankings in higher education”. *Journal of studies in international education* 11.3-4 (2007): 306-29.

⁵⁵ Bartelse, J.A. and van Vught, Franciscus A. “Institutional profiles: Towards a Typology of Higher Education Institutions in Europe”. *IAU horizons* 2-3 no. 13 (2007):10-12.

⁵⁶ *Ibid.*

Competitive map of the global scientific and educational space.

The method of drawing up market maps of the global scientific and educational space, which was previously grounded and tested, gives the possibility of constructing maps, both based on qualitative and quantitative indicators⁵⁷. Unlike cluster analysis or mapping, it makes it possible to stratify countries as subjects of the world of educational space, not only in terms of a certain indicator, but also in its dynamics. The results of cluster analysis require further analysis, interpretation of results, while the compilation of competitive maps is the result applicable for use. Unfortunately, the lack of data for all countries over the long period is one of the restrictions on the drawing up of market maps, so only 122 countries are represented in our sample⁵⁸.

During the period from 2008 to 2014, in only 34 OECD countries, which invest up to 12% of GDP in education, 450 different educational reforms have been implemented⁵⁹. Such activity is conditioned by finding ways to increase the competitiveness of national higher education systems. Therefore, grouping countries by constructing competitive maps will reveal not only the static effectiveness of national education systems, but also the effectiveness of transformations, in particular in the short and medium term impact on GDP.

The application of methodology for generating market maps of the global scientific and educational space made it possible to construct a map of the quality indicator of national educational systems 2007-2017 (Table 4). In comparison with the maps⁶⁰, which were composed during previous periods, there are changes in the disposition of countries. So, for example, Great Britain, India, Brazil, Saudi Arabia, Argentina, Georgia improved their competitive position, while Japan, France, the Russian Federation, Turkey, Indonesia, Norway, Ireland, Singapore, the Philippines, Chile, Ukraine, Romania and Bulgaria – have worsened.

All G-7 countries are highly competitive countries, and Qatar, Switzerland, Singapore, Finland and Belgium are among the leaders in terms of quality education systems. Models of business perfection are realized in most countries with strong competitive positions on a national scale.

⁵⁷ Ilnytskyy, D. "Countries on global scientific and educational map: intellectual property protection in Romania and Ukraine". *Ecoforum* 4 no. 2(7) (2015): 72-9.

⁵⁸ It is based on data used by the WEF to compile the index of global competitiveness of countries.

⁵⁹ "Education Policy Outlook 2015: Making Reforms Happen". *OECD: OECD Publishing*. 2015: 35.

Ilnytskyy, D. O. *Global'na konkurenciya v naukovu-osvitn'omu prostori*: monografiya. K. : KNEU, 2016. [In Ukrainian]

**Table 4 Global Market of Scientific and Educational Services
According to the Quality Indicator of 2007-2017 Educational System** ⁶¹

Growth rate of the market share	Amount of the market share			
	Leader	Strong competitive position	Weak competitive position	Outsider
Rapid improvement of the competitive position	Qatar	the United Arab Emirates; Germany; Bahrain; Estonia; Costa Rica; Jordan; Albania; Brunei; Trinidad and Tobago; Gambia; Sri Lanka; Portugal; China; Philippines; Mauritius; Saudi Arabia; Côte d'Ivoire; Zambia; Tajikistan; Ghana; Guyana; Jamaica; Lesotho; Italy	Armenia; Pakistan; Azerbaijan; Vietnam; Nepal; Cameroon; Ecuador; Senegal; Ethiopia; Bangladesh; Algeria; Cambodia; Panama; Namibia; Argentina; Georgia; Honduras; Mali; Syria; Mongolia; Burkina Faso; Bolivia; Dominican Republic; Peru; Chad; East Timor	
Improvement of the competitive position	Switzerland	the Netherlands; Great Britain; Luxemburg; Rwanda	Moldova; Gabon; Venezuela	
Worsening of competitive position		Norway; Malaysia; Malta; India; Ukraine ; Cape Verde	Montenegro; Kuwait; Tanzania; Iran; Mozambique; Brazil	Paraguay
Rapid worsening of the competitive position	Singapore; Finland; Belgium	Ireland; Iceland; Australia; Canada; Denmark; the USA; Lebanon; Hong Kong; Barbados; Sweden; Israel; Taiwan; Austria; France; Kenya; Japan; Indonesia; Butane; Slovenia; Zimbabwe; Cyprus; Lithuania; Czech Republic; Latvia; Spain	Botswana; Thailand; the Russian Federation; Macedonia; Kazakhstan; South Korea; Poland; Oman; Puerto Rico; Chile; Uganda; Bulgaria; Liberia; Colombia; Malawi; Serbia; Turkey; Croatia; Kirghizia; Tunisia; Greece; Sierra Leone; Uruguay; Mexico; Congo; Hungary; Madagascar; Slovakia; Nigeria; Morocco; Romania; Burundi; Guatemala; Myanmar; Bosnia and Herzegovina; Benin	Nicaragua; El Salvador; South Africa; Egypt; Mauritania; Yemen; Libya

⁶¹ Compiled by the authors: "The Global Competitiveness Report 2017–2018". *WEF*, 2017. <http://reports.weforum.org/global-competitiveness-index-2017-2018/>.

**Table 5 Global Market of Scientific and Educational Services
According to the Quality Indicator of the Education System
Considered by GDP per Person during 2007-2017⁶²**

Growth rate of the market share	Amount of the market share			
	Leader	Strong competitive position	Weak competitive position	Outsider
Rapid improvement of the competitive position				Ecuador; Tajikistan
Improvement of the competitive position		China; Germany; Great Britain; Italy; India; Brazil; Switzerland; Saudi Arabia	the United Arab Emirates; Malaysia; Argentina; Portugal; Qatar; New Zealand	the Philippines; Chile; Venezuela; Pakistan; Algeria; Kazakhstan; Bangladesh; Vietnam; Peru; Luxemburg; Sri Lanka; Dominican Republic; Costa Rica; Kenya; Azerbaijan; Bahrain; Panama; Ethiopia; Trinidad and Tobago; Jordan; Cameroon; Tanzania; Ghana; Estonia; Zambia; Botswana; Albania; Brunei; Honduras; Nepal; Senegal; Bolivia; Mauritius; Yemen; Cambodia; Namibia; Malta; Gabon; Georgia; Mozambique; Paraguay; Armenia; Burkina Faso; Chad; Mali; Rwanda; Mongolia; Moldova; Montenegro; Lesotho; Sierra Leone; Cape Verde; Liberia; Burundi; Guyana; Gambia
Worsening of competitive position	the USA	Japan; France; Canada; Australia; Spain; South Korea; the Netherlands; the Russian Federation; Taiwan, China; Mexico; Belgium; Turkey; Sweden; Indonesia	Norway; Austria; Poland; Denmark; Finland; Ireland; Singapore; Israel; Thailand; Iran; South Africa; Colombia	Greece; Czech Republic; Nigeria; Ukraine ; Romania; Hungary; Puerto Rico; Slovakia; Morocco; Lebanon; Slovenia; Croatia; Lithuania; Bulgaria; Iceland; Guatemala; Uruguay; Cyprus; Libya; Latvia; Uganda; El Salvador; Bosnia and Herzegovina; Macedonia; Zimbabwe; Nicaragua; Madagascar; Benin; Malawi; Butane; Mauritania
Rapid worsening of the competitive position				Tunisia

⁶² Compiled by the authors: "The Global Competitiveness Report 2017–2018". WEF, 2017. <http://reports.weforum.org/global-competitiveness-index-2017-2018/>.

Cluster analysis of ratings of national higher education systems. Since 2012, the comprehensive international instrument for assessing the competitiveness of national higher education systems is the Universitas-21 rating⁶³, based on international benchmarking of university education resource support systems, high school performance, international cooperation, as well as state policy and regulation in higher education. During the rating period, the methodology for calculating the competitiveness of national higher education systems was improved. Its advantage is to obtain a quantitative aggregate indicator that can be used for further analysis. Data for 2012-2017 based on four composite criteria of this rating was analysed using tree-like clustering method⁶⁴ using the software Statistics 10.0, which is visualized in vertical dendrogram⁶⁵ (Fig. 3).

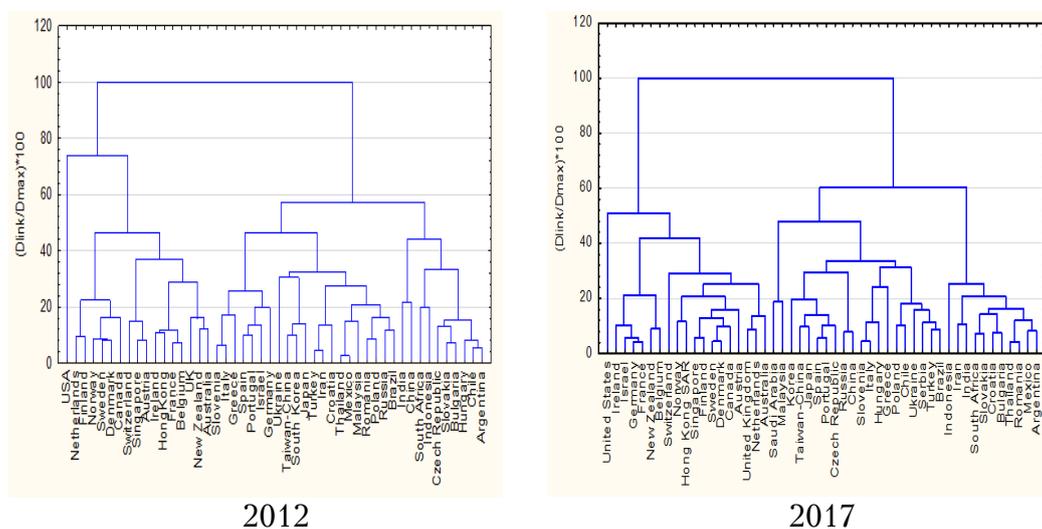


Fig. 3. Cluster Stratification of Countries by the Level of Competitiveness of National Higher Education Systems in 2012 and 2017⁶⁶

⁶³ In 2012, the rating process covered 48 countries, and in 2013-2017 – 50 countries..

⁶⁴ Amalgamation (joining) rule: complete linkage; Distance metric is: Euclidean distances (non-standardized).

⁶⁵ Clusters are built on the basis of calculating the distance between all components, in one cluster united countries, between which the relatively small distance. Step by step the process is repeated, smaller clusters (for example, from two countries) are merged into larger ones until all the sample elements are grouped together into one cluster. The position of the points in which two or more clusters are merged on the vertical axis shows how far between them is a large distance. This is what reflects the dendrogram.

⁶⁶ Compiled by the authors: Williams, R., Marginson, S., Jensen, P. and G. de Rassenfosse. *U21 Ranking of National Higher Education Systems*. Melbourne University, Universitas 21, 2017. <http://www.universitas21.com/RelatedFile/Download/664>

For all years of ranking the countries are divided into 2 large clusters, which can be characterized as leader and overtaking. During analysed period, the leadership cluster included different quantity of countries – 17 countries in 2012, 14 in 2013, 10 in 2014, 18 in 2015, 17 in 2016 and 19 in 2017. Given that the ranking does not include about 150 countries, they can be reliably attributed to outsiders, as those that do not play an important role in the development of world scientific and educational space, which will be further demonstrated by us through the compilation of competitive maps.

The undisputed leader, which forms a unique educational cluster alone, is the United States (Table 6). The Netherlands, Finland, Norway, Sweden, Denmark, being geographically close, outline the boundaries of one more world-renowned educational cluster, the range of participants of which is quite stable throughout the analysed period. The cluster of developed countries also includes Canada, Great Britain, Germany and France, as well as Switzerland, Singapore and Austria. Changes in the ranking methodology led to the fact that Ireland, Israel, New Zealand, Hong Kong also came to the second cluster.

Table 6 Results of Cluster Analysis of National Higher Education Systems Based on their Competitiveness in 2017 (4 clusters)⁶⁷

Cluster	Group	Countries and their place in the group	Average for group
I	Leader	The USA	91.6
II	Countries with strong competitive position	New Zealand, Belgium, Switzerland, Norway, Hong Kong, Singapore, Finland, Sweden, Denmark, Canada, Austria, United Kingdom, the Netherlands, Australia, Ireland, Israel, Germany, France	75.35
III	Countries with weak competitive position	Saudi Arabia, Malaysia; South Korea, Taiwan, Japan, Spain, Portugal, Czech Republic, Slovenia, Italy, Hungary, Turkey, Greece, Poland, Slovakia, Ukraine , Serbia, the Russian Federation, China, India, Brazil, Chile	51.70
IV	Outsiders	Indonesia, Thailand, Iran, South Africa, Croatia, Bulgaria, Romania, Mexico, Argentina	42.00

An indication of the dynamism of competitive positions is the constant improvement of a generalizing indicator by the global leader, which generally has a tendency to increase, while the following clusters have a significant volatility of the average level (Table. 7). The average of the second and the third clusters fluctuate at the same level, while the fourth one tends to decrease. The 2017 rating also shows an increase in the asymmetry of levels of development of national education

⁶⁷ Ibid.

systems, since the maximum (USA) and the minimum (4 cluster) indicators for the entire ranking time are observed.

Table 7 Dynamics of Medium Values of Generalized Indicators Based on Universitas-21 Rating⁶⁸

Cluster	Average for group					
	2012	2013	2014	2015	2016	2017
I	81.63	88.48	90.98	90	91.28	91.6
II	73.55	76.26	79.80	79.86	71.82	75.35
III	50.57	55.03	60.35	62.56	55.77	51.70
VI	46.84	43.29	45.93	44.23	43.79	42.00

The division of countries into clusters is rather conditional, because it confirms their proximity based on the levels of indicators used for analysis, rather than the presence of actual connections between them or participation in shared value chains. Although one should be aware that similar levels of development of the country will tend to develop relationships as compared to those with significant differences, or the similarity of challenges facing them. For example, the attribution of Norway and Hong Kong, Saudi Arabia and Malaysia to some clusters in 2016-2017 is only prerequisite for the development of relations rather than the identification of their existence.

The calculations show a stable division of countries into four groups according to the level of competitiveness of national higher education systems. The first group is formed by the United States alone, the best estimates of which are due to the priority of parameters of the environment and the results with rather high rates of resources and connections. In general, the conformity of increasing the gap between the leader and all other countries is traced. Only in 2014, the 5% reduction in resource weight and corresponding increase in the weight of connections slightly distorted the final quantitative parameters while maintaining the overall trend. That is, the USA is not only the solid leader, but also strengthens its dominance in the global educational field.

The second group includes the most developed countries, the competitiveness of higher education systems of which is based on the development of financing system and is proven to be popular among foreign students. The level of public funding of higher education is the highest in six countries: Denmark, Singapore, the USA, Canada, Sweden and Switzerland. Total funding as a share of GDP is the highest in the USA, Chile, Saudi Arabia and Canada. Private funding is

⁶⁸ Ibid.

particularly important in the USA, and the highest spending on research directly at HEIs is in Denmark, Sweden, Switzerland and Finland. The funding per student, including research costs, is the highest in Singapore, the USA, Switzerland and the UK. Denmark, Switzerland and Sweden still rank first in research costs at higher education institutions. It is almost one percent of GDP in Denmark, which is three times the average for 50 countries⁶⁹, p.11.

The distance between the USA and the average score in the second group is gradually increasing from 8.08 points in 2012 to 19.46 points in 2016 and decreased to 16.25 in 2017. The closest competitor in 2013 was 3.6 points (Sweden), and in 2017 it increased to 5.8 points (Switzerland). Due to the developed environment, connections and resource base, higher education in the USA is today the absolute leader. However, continental, regional and neighboring competitions are also important. In this sense, the entering to the second cluster of five Nordic countries (Sweden, Finland, Denmark, Norway, United Kingdom) attracts attention. Countries like Sweden, Denmark, Singapore, Switzerland are part of a group of leading countries, mainly due to the high level of high-tech education in higher education.

Among the countries of East Asia, the second cluster hit Hong Kong, and to the third hit South Korea, Japan, Taiwan and China. In general, for six years, the Chinese system of higher education demonstrated a gradual improvement of the indicators, and in 2017 moved from the last cluster of outsiders to the third. These countries are known for the implementation of focused strategies in the scientific and educational sphere. Among the countries of Eastern Europe in the third group are Slovenia, Czech Republic, Hungary and from 2017 – Serbia and Poland; in the fourth – Slovakia, Bulgaria, Romania. In 2017, Ukraine moved from the group of outsiders to the third cluster joining Chile, Brazil, the Russian Federation and Turkey.

The characteristic features of most of the countries included in the Universitas-21 rating are also the implementation of a focused national policy in the field of quality management of higher education and business perfection as the basis for competitiveness of national systems of higher education and economies. Especially noteworthy is the USA, where the Boldridge model dominates, the European countries (Germany, France, Spain), where the model of EFQM is widespread, and the Asian countries that often combine different models, and Japan, which is the birthplace of KAIZEN.

The data used to cluster the education systems of countries, allows us to construct a competitive map of the world education market,

⁶⁹ Williams, R., Marginson, S., Jensen, P. and G. de Rassenfosse. *U21 Ranking of National Higher Education Systems*. Melbourne University, Universitas 21, 2017. <http://www.universitas21.com/RelatedFile/Download/664>

modifying the standard methodology⁷⁰. After grouping national systems of higher education in terms of competitiveness, we classify them at rates of growth of competitiveness. The countries in which the competitiveness of higher education systems is increasing are the following: the United Kingdom, Switzerland, the Netherlands, Singapore, Austria, Czech Republic, South Africa and India. We will calculate the growth rates of the generalized indicator to analyze the change in the level of competitiveness of education systems. We will use the data of Universitas-21 for 2012 and 2017 for calculation, and for countries that have not been included in the rating system of 2012 (Saudi Arabia and Serbia), we will take data for 2013 as starting.

The average growth rate was -2.85% during 2012-2017, which confirms a generalized tendency to reducing the competitiveness of education systems in the population of analysis, that is, to widening the gap between the leader and other countries. The mean square deviation in this case will be 8.1. Based on the statistical properties of such an indicator of variation of the sign as the mean square deviation, in the process of determination of boundaries of the groups, the three mean square deviations are not used, as suggested by G. L. Azoyev⁷¹, but one. The results obtained enable a two-dimensional classification of countries of the world for the competitiveness of their education systems (Table 8).

As compared to the data for 2016, there are several countries that have been able to significantly boost growth (Hong Kong, Saudi Arabia and South Africa moved from the second to the first group, Turkey from the third to the second). At the same time, the Netherlands moved to the second group, Spain and Indonesia to the third, and Mexico joined the group of countries, the competitive position of which is rapidly worthening.

As it can be seen from the competition map, the USA holds the sole leadership. The group of countries with strong competitive position remains almost unchanged, only Israel and Ireland have joined the contenders for leadership, and slight variations in the growth rates of competitiveness are demonstrated by Hong Kong and the Netherlands. However, the last two groups are more dynamic. Thus, the group of countries with weak competitive position has decreased for South Africa and Slovakia and has been replenished with China, Chile, Turkey, the Russian Federation, Poland, Serbia and Ukraine.

⁷⁰ Azoev, G. L. and A. P. Chelenkov. *Konkurentnyye preymushhestva firmy*. OAO "Typografyya "NOVOSTY'", 2000. [In Russian]

⁷¹ Azoev, G. L. *Konkurencyya: analiz, strategyya y praktyka*. Centr ekonomyyky y marketynga, 1996. [In Russian]

Table 8 Competitive Map of the Global Education Market Based on the Universitas-21 for 2012-2017⁷²

Classification groups			According to the level of competitiveness of national systems of higher education in 2017			
			I	II	III	IV
			Market leaders	Countries with strong competitive position	Countries with weak competitive position	Market outsiders
According to the rates of growth of the level of competitiveness of education systems during 2012-2017	I	Countries the competitive position of which is rapidly improving		Switzerland, Singapore, Great Britain, Hong Kong	Malaysia, Saudi Arabia, China	South Africa, India
	II	Countries the competitive position of which is improving	the USA	Israel, Denmark, the Netherlands, Australia, Austria, Belgium, Sweden, Finland, New Zealand, Germany	Czech Republic, Taiwan, Korea, Italy, Hungary, Chile, Slovenia, Turkey	
	III	Countries the competitive position of which is worsening		Ireland, Canada, Norway, France	Spain, Japan, Portugal, the Russian Federation, Poland	Slovakia, Argentina, Brazil, Croatia, Indonesia
	IV	Countries the competitive position of which is rapidly worsening			Greece, Ukraine , Serbia	Bulgaria, Romania, Mexico, Thailand, Iran

Ukrainian dimension. Analysis of the competitive map in 2007-2017 based on the indicator of quality of the education system revealed that the higher education system of Ukraine is characterized by high level, although the strong competitive position is worsening (Table 4). However, it does not transform into high indicators of socio-economic development (Table 5). According to the majority of other classifications, the higher education system of Ukraine can be classified as a transitional type.

Domestic higher education, according to world rating data, loses competitive positions, and Ukraine begins to gravitate towards outsiders of the world educational market (Table 5). According to the Universitas-21 rating, it showed a steady worsening of competitiveness, which was manifested in the fall of generalized indicator from 58.6 in 2012 to 42.1 in 2016 (corresponds to the loss of competitive positions from the 25th in 2012, the 35th in 2013, the 42nd in 2014, the 41st in

⁷² Compiled by the authors.

2015, and the 42nd in 2016), which certifies increasing the backlog from the leader (the USA) and groups of other developed countries. The year 2017 was positive, since the aggregate estimate increased by 5.6 points, which allowed the higher education system of Ukraine to rise to 35th place with a rate of 47.7, which conditioned the country's stay in a group of countries with a weak competitive position (Table 8). Moreover, the growth is recorded in all four groups of indicators of the rating: connections by 32.8%, resources by 26.2%, environment by 5.5% and results by only 1%. In 2017, Ukraine ranked high 18th place according to the total subindex of resources (with a score of 66.9% from the leader level – Sweden); the largest gap is characterized by the subindex of results, where Ukraine has been ranked 45th out of 50 countries for three consecutive years (23.5% of the USA leader's level). According to the last two groups, the lag is lower, although it is also noticeable: Ukraine took 38th place according to the sub-index of interconnection (36% of the Swiss leader's rank) and 37th according to the subindex of environment (72.8% of the leader's level of the USA).

Ukraine is likely to be a unique case in the world educational market. After all, in conditions where the country is in fourth place on education expenditures, as a share of GDP, Ukraine ranks only 47th in the ranking according to the indicator of higher education funding per person. Unfortunately, the high quality of higher education system is not transformed into a high income per person. Therefore, the country has the choice of two strategic vectors – raising the level of socio-economic development to the quality level of the system of higher education or reducing the quality of the system of higher education to the level of socio-economic development. Reflecting on this issue, one should take into account the high inertia that is inherent to higher education, so we have to take the chance to implement the very first of the above scenarios.

The results of study of the competitiveness of higher education systems give us reasons to propose a number of recommendations. Thus, the leaders of the state and the system of higher education should recognize its priority direction of development of the competitiveness of national economy and the country as a whole, a leader in the formation of a high culture of excellence in society. Priorities of development of the main components of competitiveness of the higher education system of Ukraine can be summarized as follows:

- the focus of higher education system on the results of activities, which can be guided by the experience of leaders, such as the USA, Great Britain, Australia, Denmark, Sweden and Switzerland;
- increase the efficiency of internal and external relations of the higher education system with the main stakeholders, the guides of which are Switzerland, Great Britain, Austria, Denmark;

- comprehensive development of the educational environment, which can be guided by the experience of the USA, New Zealand, Australia, Singapore, the Great Britain and Hong Kong;
- improving the quality of resource base for the development of higher education system, the guides of this are Sweden, Denmark, Canada, Singapore, Switzerland and the USA.

Based on the provisions of the EFQM model, Ukraine should take a series of steps. Thus, the continuous improvement of Ukraine's higher education system should include identifying and responding to external challenges in an effective and efficient way. The purposeful creation of a common value with consumers of the higher education system of Ukraine should be conducted on the basis of studying their interests and involvement in decision-making. There should also be an improvement in the conditions for attracting the best professionals to the process of creating and providing educational services and scientific products, promoting their personal and professional implementation. Priorities should include the development of motivational mechanisms for continuous improvement of the system of higher education and its results on an innovative basis; the sustainable future of society through the generation and dissemination of knowledge, propaganda of values and the effective realization of national intellectual capital. Increasing the competitiveness of higher education system should take place on the basis of formation and development of value-creating chains, the provision of a coherent chain of cooperation and improvement of the activities of each of the links. The continuous achievement of outstanding results in higher education of Ukraine and ensuring their sustainable achievement in the future should be based on the management of key performance indicators.

Conclusions

Depending on the purposes of using the results of grouping countries, the researchers can apply different approaches, each having drawbacks and benefits. The easiest way is to recognize a simple ranking according to a certain criterion. Ranking through visibility is best suited to end users, who need to satisfy their own curiosity with minimal time consuming. Often, the first 10-20 countries and countries that are specific to the user will fall into the area of their curiosity. Clustering of educational systems by a certain indicator or their group is an approach that allows a more objective grouping of countries. The compilation of competitive maps is appropriate in situations where it is necessary to take into account both the share of country in the general system and its dynamics, which is important for those who make

strategic decisions. For professional researchers, the simultaneous application of several approaches is widespread in the light of expediency under certain conditions.

Various approaches to grouping countries around the world, including compilation of competitive maps and cluster analysis, confirm that leadership in the global educational market belongs to a limited group of countries. The compilation of competitive maps confirmed that precisely in the cohort of about 20 countries the global trends in higher education are developing, while other countries are in the worse position associated with the competitiveness of national economies.

Almost all countries represented in Universitas-21 can be attributed to those of the second and third stages of development, or intermediate between these stages, as it was classified according to the WEF. On the other hand, countries that are not represented at Universitas-21, are most often referred by the WEF to countries that are in the first stage of development or moving to the second. Stratification of the countries under the dominant paradigm of higher education makes it possible to attribute the USA and countries with a strong competitive position to those where education 4.0 is formed, countries with a weak competitive position – education 3.0, countries with an outsider position – education 2.0, including countries not represented in the Universitas-21 rating – education 1.0.

The analysis of vertical dendrograms of countries according to the level of competitiveness of national higher education systems during 2012-2017 has shown that the positions of countries are rather volatile and may change significantly from year to year. Such significant fluctuations also indicate an imperfection of rating as a tool for measuring the level of competitiveness of education systems of countries in the world market, and currently there is no alternative to it. Therefore, the subject of further research and practical implementation may be justification of the best instruments for measuring the international competitiveness of higher education systems.

According to the results of study, it can be concluded that Ukraine needs a well thought-out and integrated approach to increasing the competitiveness of higher education system. A substantial increase in specific expenditures for higher education is necessary, if the country actually seeks to develop the competitive potential of domestic universities. The Government should develop and effectively implement the competitiveness strategy that should integrate the key priorities of reforming the national higher education system – improve performance, operational resources, institutional and functional relationships, and develop the environment.

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The article was received by the editorial board on 01.11.2017