Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2018. Vol. 40. No. 3: 329–336.
Article DOI: https://doi.org/10.15544/mts.2018.31

GLOBAL INNOVATION SPACE FORMATION

Deniss Djakons[1], Iryna Kalenyuk[2], Liudmyla Tsymbal[3]
[1] Assoc. Prof. Dr. Information Systems Management Institute. Address: 1 Lomonosova Str., build. 6. Riga, Latvia, LV-1019. Tel. +371 129 104186. E-mail deniss.djakons@isma.lv
[2] Prof. Dr. Kyiv National Economy University Named After Vadym Hetman. Address: 54/1 Prospect Peremogy 03057 Kyiv, Ukraine. Tel. +380 96 7505810. E-mail kalenuk@ukr.net
[3] Assoc. Prof. Dr. Kyiv National Economy University Named After Vadym Hetman. Address: 54/1 Prospect Peremogy 03057 Kyiv, Ukraine. Tel. +380 93 2395608. E-mail l.tsimbal@ukr.net

Received 26 07 2018; accepted 26 09 2018

Relevance of the article is due to the dynamic processes of the formation of a global innovation space (GIS), which links the intellectual activity of the countries of the world into a single system and expands the possibilities for international cooperation. The purpose of the article is to identify the main trends in the formation of the GIS and to determine, on this basis, key areas for the effective entry into it of each country. In the article used the methodology of comparative analysis and assessment of the dynamics of key indicators of innovation activity of the leading countries of the world (2007–2017). Results: the main trends in the development of the GIS were revealed; the directions of effective participation of each country in the ISU are substantiated taking into account the requirements of world ratings, intensification of competition for achievement of leadership positions at the global level.

Key words: global innovative space, innovations, model of development R&D.
JEL Codes: I23, I25.

1. Introduction

The processes of innovation development in the global economy have long ago become an important subject of scientific research, i.e. their factors, mechanisms, tools, dynamics, etc. At the same time, the dynamism of the processes of innovation development leads to the appearance of qualitatively new phenomena and trends, in particular, the formation of a global innovation space (GIS). GIS became the subject of study in a large number of research papers of both domestic and foreign scientists. Klinger and Lederman (2006) explore the empirical relationship between economic development and innovations inside the Global Technological Frontier.

Boutellier, Gassmann et all (2008) explore the challenges and main trends in the formation of a GIS, analyze the key areas for the accumulation of innovation and the formation of intra-industry networks. Cooke (2017) identifies opportunities for the creation of global innovation networks and territorial ICT-based innovation systems. Jensen (2017) explores the role of global innovation in the global dynamic environment, the opportunities for collaboration to shape global innovation and global knowledge flows.

The current stage of globalization development is constantly filled with new processes, which in turn require detailed study The processes of the emergence of qualitatively new phenomena and trends, which are its result, in particular, the formation of the GIS are needed. This global space is characterized by interdependence and dynamism of development of all components. The functioning and development of any entity cannot occur on its own, without taking into account the main trends and inclusion in the processes of the global order of innovation activity.

The goal of the article is to identify and systematize quantitative and qualitative changes in the development of components of global innovation activity and the synthesis of identified phenomena and processes. Detection of these new features is possible on the basis of a solid systematic structural analysis, the identification of quantitative and qualitative changes in the development of components of global innovation activity (global ratings, the formation of innovation networks, human resources development, the market for the results of intellectual activity, joint innovation activities, etc.) and the generalization of the identified phenomena and processes.

Scientific literature review and modeling methods suggested quantitative empirical study to be performed in finding actual evidence for solutions of defined scientific problem. Descriptive statistical analysis and visualization methods were applied to organize the research results.

2. Peculiarities of global innovation space formation

In modern conditions, the role of intellectual development factors is growing dramatically. There is a general intellectualization of the economy, the key factors of which are education and science. Their influence is substantially increased: both directly and through influence on other factors and driving forces of development of society (AbuMezied, 2016). The achievement of intellectual leadership that begins to be perceived as a factor in ensuring competitiveness in the knowledge economy. There is an expansion of the scope of understanding of intellectual leadership – how to manage the change in the business environment (Blinder, 2008). All these changes form the basis of the formation of a GIS as a new phenomenon that acquires characteristics of the common market, the rules of which are determined by key innovators.

The formation of a GIS is a dynamic process that is characterized by activation of innovation activity and factors of economic development, the spread of global forms of interaction between different subjects of innovation, the intensification of competition for leadership positions at the global level (Kubik, 2013) Fierce competi-

eISSN 2345-0355. 2018. Vol. 40. No. 3: 329–336.
Article DOI: https://doi.org/10.15544/mts.2018.31

tion in the innovation space is accompanied by constant changes of disposition among the countries of the world, including among the most innovative countries. Top-20 most innovative countries mostly include high-income countries, although relatively new leaders are beginning to pour out new outsiders. Over the past ten years, the map of innovative economies has changed significantly (Table 1).

Table 1. The dynamics of economies according to the Global Innovation Index, 2007–2017 (GII, 2017)

Country	2007	2017	Change position	Country	2007	2017	Change position
Ireland	21	10	+11	Singapore	7	7	0
Sweden	12	2	+10	Luxembourg	10	12	–2
South Korea	19	11	+8	UK	3	5	–2
Iceland	20	13	+7	USA	1	4	–3
Netherlands	9	3	+6	Hong Kong	10	16	–6
Norway	25	19	+6	Germany	2	9	–7
Switzerland	6	1	+5	Canada	8	18	–10
Denmark	11	6	+5	France	5	15	–10
Finland	13	8	+5	Japan	4	14	–10
Austria	22	20	+2	Belgium	15	27	–12
Israel	18	17	+1	UAE	14	35	–21

For the seventh consecutive year, Switzerland is the global leader in terms of innovation, which has improved its position by 5 points over the past 10 years. In general, almost all countries showing a positive growth (except for Norway and Austria) were among the top 20 countries in the ranking in 2007. The US has lost its leading position during this time, while remaining in high positions Countries are showing significant gaps between the values of individual indicators (Table 2).

In general, the global leaders in terms of innovation show the highest positions in terms of knowledge, technology products and performance. The role of the creative component for an innovative economy is undeniable, as evidenced by research (Baculakova, 2017). A significant gap between individual indicators explains the focus of individual countries' activities on particular segments of economic activities.

In GIS, a unique landscape of innovation activity is formed, and it forms standard approaches to assess its effectiveness. Extremely high performance is demonstrated by highly developed countries. At the same time, some developing countries, in particular, Malaysia, Thailand, Vietnam, the Philippines, Indonesia and Cambodia, are substantially improving their performance.

Table 2. Top-10 countries by indicators, position in the ranking, 2017 (GII, 2017)

№	Country	Institutions	Human capital	Infrastructure	The complexity of the market	The complexity of business	Knowledge and technological results	Creative results
1	Switzerland	8	7	6	7	3	1	3
2	Sweden	10	4	3	10	4	3	11
3	Netherlands	11	19	14	17	1	2	5
4	USA	17	13	21	1	8	7	10
5	UK	9	6	5	5	13	13	4
6	Denmark	6	3	15	6	12	16	9
7	Singapore	1	5	2	4	2	11	32
8	Finland	4	1	8	13	6	10	18
9	Germany	18	10	20	16	15	8	7
10	Ireland	12	18	17	25	10	5	13

The assessment of efficiency takes into account the ability to make significant investments in education and research with to obtain a social and commercial effect; number of engineering graduates and employees in the field of science and technology; opportunities of talents realization in business structures; the high proportion of exports of creative goods, the cost of world companies, cooperation business and science, the number of patent applications (Table 3).

Table 3. Key indicators of innovation activities of global key innovators

Country	The average cost of the three leading world companies to the R&D, 2016		Collaboration universities and business, 2016		Researchers in business, per 1000 population, %, 2015		Patent applications by origin, amount per bil. GDP, 2015	
	Value, mil.	Mark	Value, (0–7)	Mark	Value	Mark	Value	Mark
Switzerland	6880.31	0.98	5.80	1.00	46.16	0.65	17.74	0.97
Sweden	2177.94	0.92	5.16	0.91	68.56	0.94	12.34	0.93
Netherlands	2382.30	0.93	5.50	0.97	59.08	0.86	11.06	0.93
USA	11774.73	1.00	5.57	0.98	71.01	0.96	15.99	0.96
UK	3826.19	0.95	5.47	0.96	38.16	0.58	7.37	0.88
Denmark	880.30	0.87	4.84	0.89	58.02	0.83	13.09	0.94
Singapore	403.62	0.83	5.47	0.95	50.51	0.74	3.11	0.74
Finland	980.14	0.89	5.72	0.99	56.77	0.82	14.63	0.95
Germany	8986.88	0.99	5.35	0.94	56.51	0.81	18.71	0.98
Ireland	1999.59	0.91	5.11	0.90	53.82	0.79	2.74	0.71

Systematized by the authors based on (GII, 2017; UNESCO)

At the same time, the gaps in these indicators are also quite significant. The role of university in modern world is one of the majors (Paleari, 2015). The US is leading the research and development cost of three large companies, outpacing almost 30% its successor, Germany. In general, the US is among Top-10 innovative economies in the

eISSN 2345-0355. 2018. Vol. 40. No. 3: 329–336.
Article DOI: https://doi.org/10.15544/mts.2018.31

world by almost all indicators. As the analysis shows, all key innovation countries have quite high level of effective indicators of scientific activity.

The analysis of the results of innovation activities suggests that the intellectual leadership of the most innovative countries is backed up by a very active position and policy of the state. Thus, only some of the selected countries are not included in the TOP-10, but this may be due to their orientation towards other types of innovation activity. In general, the formation of open innovation networks occurs. Their main goal is the formation of incoming flows of innovation or key factors that can promote the development of innovation. The spread of ICT creates new opportunities for co-operation, information seeking and the exchange of results between the various levels of global economy (Jaehan, 2018). The possibilities of information exchange enable accelerating all economic and innovative processes in the global space, reducing transaction costs, creating powerful network accounting systems, trading, business communications, joint innovations, etc. (Hvizdova, 2016).

An important factor in the formation of GIS is the international movement of human resources, the attraction of specialists from abroad and young people to study at higher educational institutions. Student mobility for many countries is a prerequisite for the development of innovation. The rapid increase in the number of foreign students in the world in turn means the formation of a global market for educational services. The number of foreign students grew slowly from 0.8 mil. in 1975 to 1.7 mil. in 1995, and from the beginning of the 21st century it is gaining momentum: in 2005 – 3.0 mil., in 2010 – 4.2 mil., in 2014 – 4.6 mil. people.

Between the countries of the world there is a sharp competition for their share in this market, for attracting foreign students, which minimizes the cost of their initial training. In recent years, the turbulence of the global educational environment has undergone rapid changes, which rapidly change the balance of forces and cause the emergence of new processes and phenomena. This is reflected in the decline in OECD market share (from 76.4% to 71.9% during 2007–2014), the emergence of new active actors (China, Saudi Arabia, Russia), weakening the position of traditional leaders in the educational services market (US, UK, Australia, Germany, etc.).

Changes are also taking place among importing countries (Table 4). Among the main leaders of the importing countries, we see quite different countries. The increase in the flow of those who go abroad for education is far from always due to the unfavorable situation in the country (Card, 2005). Thus, China has developed a clear strategy for funding its own students abroad, who worked out the criteria and incentives for their return to their homeland after graduation (Choudaha, 2014). As a result, we can see both emerging and developed countries among the leaders of the importing countries.

Table 4. Number of students studying abroad by origin country

	1998	2005	2010	2017	%, 2017/1998
China	151 055	407 520	570 449	847 259	561
USA	38 208	52 699	57 506	68 580	180
Saudi Arabia	9 941	12 398	42 651	85 277	858
Vietnam	7 858	20 801	47 268	70 328	895
Russia	26 096	39 508	50 403	56 915	218
Greece	62 059	41 687	29 226	37 484	60
Japan	57 088	69 273	40 330	30 850	54
Brazil	15 596	19 424	27 753	43 438	279
UK	28 142	23 053	24 600	33 109	118
Mexico	13 149	23 048	26 072	30 646	233

Systematized by the authors based on (UNESCO)

Thus, the multiple increase in student migration confirms the thesis of the concentration of human and intellectual capital in developed countries and its outflow in developing countries. An analysis of the migration patterns of students from China and the US confirms the concentration of the European direction in Germany, UK, France and Austria in particular. As a result of the research it was revealed that in the process of formation of the GIS, the dominant factors are intellectualization processes, namely human capital, creative and technological results.

3. Conclusions

1. It can be stated that the formation of a GIS is a dynamic process characterized by processes of increasing the influence of intellectual factors on the dynamics of world economic development, the formation of global innovation networks, acceleration of human resources movement, creation of global systems of measurement and evaluation of innovative development for both individual entities and general trends.

2. Under the influence of fierce competition, there are constant changes in the country's disposition: new outsiders are emerging, and the gap between global leaders and their followers is shrinking. Over the past ten years, the map of innovative economies has changed significantly. Top-20 most innovative countries mostly include high-income countries, although relatively new leaders are beginning to pour out new outsiders. Some developing countries are substantially improving their performance. In the international space of innovation, China's role is growing substantially, as it increases the speed of innovation development, the export of high-tech products, etc.

3. The dynamic development of the GIS brings to its orbit and the movement of human resources, the evidence of which is the rapid growth of the global market of educational services. Acute competition between the countries for its share in this market, for attracting foreign students leads to changes in the disposition, the emergence of new actors and new turbulent processes. There are sharp increasing of the number of students in the world (from 3.0 mil. in 2005 to 4.6 mil. people in 2014),

decreasing the share of OECD countries, the emergence of new active actors, weakening the position of traditional leaders in the global market of educational services.

4. Promotion of innovation is becoming a priority task of any country in the context of providing sustainable competitive advantages in GIS. A highly competitive environment requires from governments working out of a separate strategy for innovation development aimed at comprehensive support for priority sectors focused on the development of knowledge economy. The results of intellectual and creative activity become dominant in these conditions.

References

AbuMezied, A. (2016). What role will education play in the Fourth Industrial Revolution? – https://www.weforum.org/agenda/2016/01/what-role-will-education-play-in-the-fourth-industrial-revolution/ [21 07 2018].

Baculakova, K. Harakalova, L. (2017). Creative industries in the EU: factors influencing employment // *Economic Annals-XXI*. Vol. 164(3–4): 40–44. – https://doi.org/10.21003/ea.V164-09.

Blinder, A. (2008). Education for the Third Industrial Revolution // *CEPS Working Paper*. No. 163: 1–19 – https://www.princeton.edu/ceps/workingpapers/163blinder.pdf [21 07 2018].

Boutellier, R., Gassmann, O., von Zedtwitz, M. (2008). Managing Global Innovation. Uncovering the Secrets of Future Competitiveness. – Springer-Verlag Berlin Heidelberg. 626 p.

Card, D. (2005). Is the New Immigration Really So Bad? // *Economic Journal*. Vol. 115. No. 507: 300–323. – https://doi.org/10.3386/w11547.

Choudaha, R., Wit, H. (2014). Challenges and Opportunities for Global Student Mobility in the Future: a comparative and critical analysis, In B. Streitwieser (Ed.) // *Internationalisation of Higher Education and Global Mobility* . – Oxford: Symposium Books: 19–33 – https://doi.org/10.15730/books.87.

Cooke, Ph. (2017). Complex spaces: global innovation networks & territorial innovation systems in information & communication technologies // *Journal of Open Innovation: Technology, Market, and Complexity.* Vol. 3. No. 1: 1–23 – https://doi.org/10.1186/s40852-017-0060-5.

Global innovative index. (2017). – https://www.globalinnovationindex.org/gii-2017-report# [22 07 2018].

Hvizdova, E., Mokrisova, V., Polacko, J. (2016). Changes in research and development after crisis in selected countries // *Economic Annals-XXI.* Vol. 160(7–8): 31–34 – https://doi.org/10.21003/ea.V160-06.

Jaehan, Ch. (2018). Knowledge transfer to foreign affiliates of multinationals through expatriation // *Journal of International Economics.* Vol. 113: 106–117 – https://doi.org/10.1016/j.jinteco.2018.04.006 [13.08.2018].

Jensen, K. R. (2017). Leading Global Innovation: Facilitating Multicultural Collaboration and International Market Success. – Springer-Verlag Berlin Heidelberg. 182 p.

Klinger, B., Lederman, D. (2006). Innovation and Export Portfolios Policy: Research Working Paper. No. 3983. – World Bank: Washington, DC. 28 p. – https://openknowledge.worldbank.org/ handle/10986/8362 [19 07 2018].

Kubik, G. H. (2013). Limitless: becoming remarkable in the borderless economy // *On the Horizon.* Vol. 21(2): 114–126. – https://doi.org/10.1108/10748121311323012 [13 08 2018].

Paleari, S., Donina, D., Meoli, M. (2015). The Role of the University in Twenty-first Century European Society // *Journal of Technology Transfer*. Vol. 40. Issue 3: 369–379. – https://doi.org/10.1007/s10961-014-9348-9.

PASAULINĖS INOVACINĖS ERDVĖS FORMAVIMAS

Deniss Djakons[1], Iryna Kalenyuk[2], Liudmyla Tsymbal[3]
[1] Assoc. prof. dr. Informacinių sistemų valdymo institutas. Riga, Latvija
[2] Prof. dr. Vadymo Hetmano Kijevo nacionalinis ekonomikos universitetas.
El. paštas kalenuk@ukr.net
[3] Assoc. prof. dr. Vadymo Hetmano Kijevo nacionalinis ekonomikos universitetas.
El. paštas l.tsimbal@ukr.net

Šiandien aktualu sujungti į vieną sistemą dinamiškos pasaulinės inovacijų erdvės (PIE) formavimo procesus, susietus su pasaulio šalių intelektine veikla, nes tai paskatintų plėsti tarptautino bendradarbiavimo galimybes. Straipsnio tikslas – nustatyti pagrindines PIE formavimo tendencijas ir šiuo pagrindu pasiūlyti pagrindines kiekvienos šalies veiksmingo įėjimo į jas sritis. Straipsnyje panaudota pagrindinių pasaulio šalių inovacinės veiklos rodiklių dinamikos analizės ir įvertinimo metodika (2007–2017). Rezultatai: atskleidžiamos pagrindinės PIE raidos tendencijos; yra pagrįstos kiekvienos šalies veiksmingo dalyvavimo PIE kryptys, atsižvelgiant į pasaulinių reitingų reikalavimus, konkurencijos intensyvinimą siekiant lyderio pozicijų pasaulio mastu.

Raktiniai žodžiai: pasaulinė inovacinė erdvė, inovacijos, inovacinis plėtros modelis, MTTP.
JEL kodai: I23, I25.