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The university' international scientific activity

Annotation
The modern tendencies in research activities of higher education are analyzed in the article. The especial accent is put on the analytical characteristic of the structure and dynamics of different forms of the universities' research activities in developed countries. The author puts the emphases on the prospects of business sector financing in universities' research activities.

Keywords
University, Higher Education Sector, Business Sector, Diversification, Research Activity, Mobility.

1 The problem statement

Tendencies of development of the global educational environment clearly demonstrate the dynamic transformation of higher education institutions from the transmitters (translators) for power generators of knowledge and innovation. Accordingly, it is definitely to talk about changing the orientation of university' functioning type in the polyvector direction their activities. Diversification of the features of modern universities is shown to provide continuous and stable development of not only the traditional (academic, educational, economic, scientific), but also new (innovative, entrepreneurial, international) directions of their activities. The integration and strengthening the links between universities performed functions facilitate.

2 The review of latest scientific progress and publications

The growing role of the universities in the development of global economy causes the great scientific interest to the issues of regularities and tendencies of higher educational institutions functioning. Different aspects of modern universities development are studying both domestic and foreign scientists: Antonyuk L., Andrushchenko V., Antoshkina L., Aidrus I., Clark Burton R., Etzkowitz H., Gebhardt C., Holavko N., Kalenyuk I., Kremen V., Kuklin O., Lukyanenko D., Myklebust J.P., Mayburov I., Romanovski O., Terra B.R.C., Tsymbal L., Shultz T., Webster A., etc. Nowadays it's really important to organize the scientific research of trends, problems, barriers and perspectives of modern universities international scientific activities development.

The purpose of the article is analyze of current trends in the development of international scientific activities of universities.

3 Research results

In the modern sense of the university research activity is focused on the generation, approbation and implementation of innovation of fundamental and applied nature. The further development of the research activities of the leading higher educational institutions of both Ukraine and the world in general quite diversified. In particular, modern research activities of universities includes fundamental and applied scientific research across a wide spectrum of subjects, implementation of research results in practice management, approbation of academic achievement (on conferences, seminars, round tables, etc.) etc. Among the main directions of modern international research activities of higher education institutions are the following:

1) the research (including all stages of the implementation of the research teams of scientists universities);
2) the project activity (including all phases of the life cycle of the international scientific and educational projects: from generating ideas and find partners to implement and ensure their sustainability in practice);
3) the mobility (as scientists conduct research abroad through grants and participation in foreign scientific events);
4) the commercialization (patenting, search for potential business partners, the practical implementation of innovations generated by university researchers).

Analysis of issues of research activity (including international), it is logical to start with a brief review of its personnel structure in the world. In particular, according to data reported by UNESCO Science Report, the largest number of researchers (full-time equivalent) per one million population in 2013 show: Israel (8337 researchers per million population), Denmark (7271 persons), Finland (7223 pers.), Iceland (7012 pers.), Sweden (6509 pers.), Republic of Korea (6533 pers.) [1].

The scale of international research activities of universities are disclosed in terms of the number of foreign (in particular cited) publications in cooperation with foreign partners too. As the Scientific Report UNESCO, the most popular as co-authors of scientific publications are the United States of America, scientists as well as - Germany, France and the United Kingdom (Table 1) [1].

In general, 2,151,480 scientific publications have been published the United States for the period 2008-2014, of which 34.8% or 749,287 are published in collaboration with foreign scientists; and 14.7% of the articles published in journals included in the most cited scientific publications [1]. In the European Union the highest number of publications in the foreign co-exhibit have been published in United Kingdom (325 807 publications), Germany (320 067) and France (238,170) [1].

The high degree of dynamism of the global educational environment in combination with an active scientific and technological progress are responsible for the constant development, improvement, extension and complexity of international research activities as a whole and its components and areas in particular. University status required the need for research and development activities and to maintain a highly competitive position in the global market of educational services requires the movement of the higher educational institutions to the continued expansion of sales volumes of highly effective and commercially

Table 1 Indicators of international scientific publications

Country	Number of publications with international co-authors, units. 2008-2014	Percentage of publications with international co-authors, % of the total number of publications, 2008-2014	Percentage of papers in 10% most-cited papers, %, 2008-2012
1	2	3	4
Canada	180 314	50,4	13,1
USA	749 287	34,8	14,7
Belgium	74 806	64,8	15,3
Czech	32 788	51,1	8,8
Denmark	52 635	61,7	16,6
Estonia	5 381	60,8	13,0
Finland	38 945	57,9	12,7
Francew	238 170	54,3	12,7
Germany	320 067	52,6	13,5
Ireland	25 368	59,1	14,3
Italy	168 632	46,0	12,0
Latvia	1 942	55,8	6,7
Nederland	118 246	58,3	16,8
Poland	49 019	34,0	5,7
Portugal	37 997	55,0	11,2
Romania	17 192	38,0	7,5
Spain	147 698	47,8	11,8
Sweden	84 276	61,7	14,1
United Kingdom	325 807	55,9	15,1
Ukraine	15 761	47,5	4,4
Belarus	4 274	58,4	6,6
Russian	64 190	33,0	3,8
China	277 145	24,4	10,0
Japan	142 163	27,1	7,8

Source: [1]

attractive research projects. In addition, the international research activity is not only one of the most important functions of higher education institutions, but also becoming an important source of financial revenue and the link between the education system and the real economy.

The universities research activities integrated into the total network functions performed by universities and cannot be considered separately from the other tasks. Scientific analysis of international research university requires, in our opinion, priority analysis of the financial aspects, which create the preconditions for the development of active and successful competition in the global market of educational, scientific and technical services and innovative developments.

The results of a retrospective statistical analysis suggest the prevalence of the state budget in the financing of the majority of universities in the world, which is a main tendency of development of educational space of the last century. A stable trend of diversification of funding sources is visible at the beginning of the XXI century [2, 3], which can be explained by two complex factors:

1) the growing failure of government budgets around the world, due to the complexity of the development of national economies and burdened by external debt build-up state. For a significant number of countries, an increase in public funding of the higher education system has limited capabilities, and a whole does not meet the needs of higher education institutions in ensuring development in accordance with the modern challenges of the global educational environment;
2) gradual transformation of higher education institutions in the full economic actors. With limited public funding for universities are forced to search of additional sources of finding their own budgets.

That is why search for alternative sources of financing becomes actual, among which should be singled out grants and sponsorship. The experience of leading universities in the world confirms the prospects of such sources of funding university research. One only Harvard University in 2014 attracted to the budget of the university 117.1 million dollars in the form of non-federal sponsorship grants, an increase of $ 6 million more than in 2013 [4].

At the Massachusetts Institute of Technology in 2014, 44% of total R & D expenditure was financed by partners and only 27% of the costs (777.4 million USD) is covered without attracting sponsorship and grant aid. The aggregate annual income of the Institute of research activities is 3,124,300,000 dollars, which of them 27% (828 million dollars) in 2014 amounted to income from research conducted by the Lincoln Laboratory of the Institute, and 21% of revenues (US $ 668 million.) - from campus research [5].

Example of Princeton University also confirms the trend of consistently high interest and the financial participation of the public and private sectors in the implementation of the research activities of higher education institutions. Much of the interest of society and the country's business in advanced scientific research building manifests itself in a increasing of government (from 153 mln USD in 2000 to $ 272 million in 2014) and private (from $ 58 million in 2000 to $ 87.9 million in 2013) grant aid Princeton University [6].

Research activity is one of the most significant and long-term source of revenue to the budgets of modern universities. For example, annual income from

research at York University (University of York) amount from 45 up to 60 thousand pounds [7].

Most universities in the world are understanding the need and taking active steps to diversify funding sources with particular emphasis on enhancing the sponsors and funders of research in the field. For example, the Vienna University of Economics and Business (Austria) in 2013 received research grants totaling 17.2 million euro, which accounted for 12% of all higher education institution revenue. 5.8 million Euros (ie 4.1% of total revenue) was drawn for the financing on the research projects. If we talk about the participation and contribution of the private sector in research activities of the University, then he has made more than half a million Euros [8].

The above analysis of the structure of the research activities of powerful and competitive in the world market of university funds allows you to make a reasonable conclusion about the exceptional urgency of international action in the direction of attracting foreign organizations and foundations in the form of grants. In particular, at the micro level - it grants individual mobility of researchers; at the meso- level - grants to teams of scientists and individual universities; at the macro level - groups of higher education institutions; on the mega-level - a consortium of universities in different countries.

Due to the fact that in modern conditions grant project activity is significant source of filling the budgets of higher education institutions, university observed active competition for grants. It is now widely popular international scientific and educational programs, the most ambitious of which are: Tempus / Erasmus+, Horizon 2020, the programs of funds: Fulbright, named Kirkland, a program of the British Council, IREX (Representation of International Research & Exchanges Board), ACLS, the International Visegrad Fund, Friedrich Ebert Foundation. Alexander von Humboldt, the NATO program "Science for Peace and Security", the Eastern Partnership program of the German Academic Exchange Service (DAAD), and others.

136 thousand applicants has filed during the period from 2007 to 2013 under the Seventh Framework Programme (7th Framework Programme), of which 25 thousand proposals has submitted. Received grant financing totaling 41.7 billion Euro. Moreover, stable leadership demonstrated the United Kingdom, the Netherlands, Germany, Sweden, Switzerland and Israel (Table 2). Through participation in the Seventh Framework Programme of the University of Oxford received the proceeds in its budget a total volume of 437 million euros, Cambridge -. 424 million euros.

During the 2002-2013 representatives of Denmark participated in the implementation of 3135 projects and the innovative nature of the research, mastered with 1.4 billion euros received from the European Commission under the Sixth (about 79 million. per year) and seventh (151.5 million. euro a year) framework programs [9].

Recent years have shown considerable interest in the scientific community program Horizon 2020 (Horizon 2020). As of 10.30.2015, within the framework of the program implemented 4190 projects, 7804 participants are organizations that have received grants. The clear leader in receiving grants are: the United Kingdom, the Netherlands, Germany, Sweden, Ireland, Israel,

Table 2 The number of projects under the EU's Seventh Framework Programme, total and by individual spheres of 2007-2013

Country	Agriculture	Environment	Energy	Health	All projects
Austria	145	157	71	191	2993
Belgium	331	214	140	295	4552
Bulgaria	43	45	18	23	590
Croatia	25	23	14	21	351
Cyprus	15	21	15	10	436
Czech Republic	85	63	22	77	1216
Denmark	197	130	97	200	2275
Estonia	29	21	11	54	502
Finland	148	83	55	166	2089
France	419	275	198	551	8909
Germany	519	425	285	776	11404
Greece	147	140	72	117	2340
Hungary	87	57	23	96	1350
Ireland	108	55	35	109	1740
Italy	460	296	183	509	8471
Latvia	24	11	13	17	267
Lithuania	24	19	12	24	358
Luxemburg	7	10	4	19	233
Malta	9	9	3	4	177
Netherlands	467	298	169	558	6191
Poland	100	76	53	96	1892
Portugal	123	94	69	68	1923
Romania	41	69	17	48	898
Slovakia	26	19	15	18	411
Slovenia	55	55	23	48	771
Spain	360	291	211	388	8462
Sweden	145	135	88	255	3210
UK	508	379	191	699	12591

Source: [1]

Denmark, Belgium, Finland, Italy. For example, eight of the Danish universities attracted in their budgets 136 million euros; four Irish University - 62.3 million euros. Large income and individual universities have: total revenue in the form of grants within the framework of Horizon 2020 at University College London - 49.9 million euros, the University of Cambridge - 44.6 million euros, Imperial College London - 43.8 million euros, Oxford University - 40.7 million euros [10].

Implementation of projects often involves the formation of a powerful consortium of universities. In particular, within the framework of Horizon 2020 has been awarded a grant of 20 million Euro consortium Atlantos project, which includes 62 partner organizations [10].

By analyzing large-scale international scientific and educational programs, it is necessary to underline the well-known program of the European Union Tempus. Among the project activities in Eastern Europe were the obvious leaders of Ukraine (involved in 33 Tempus projects in 2013) and the Russian Federation (part in 28 Tempus projects in 2013). During the period of five years (2008 to 2013) the maximum number of Tempus projects were observed in Georgia, Armenia, Serbia, Morocco [11].

International programs are designed not only for researchers and scientists, but also to the students as well. For example, a broad audience of applicants is an international Fulbright program. Table 4 presents data on the number of student grants received in the leading universities of the world. The tendency the project and the grant activity in the scientific and student community clearly demonstrated by the data table. On average, about 22% of the applicator of applications under the Fulbright student program are successful.

Participation in international scientific and educational projects, in particular in the implementation of projects through grants, at this stage of the global educational environment has become a powerful enough tool of competition on the world market. And it is quite efficient both in academia and in society as a whole in attracting students (including foreign ones) in particular.

The above factual material shows high dynamics of the international research activities of educational institutions, which is expressed in the annual increase in the rate of growth of revenues university acting increasingly significant source of their budgets.

Table 3 Dynamics of the number of Tempus projects at the regional level

Region	Country	2008	2013	The growth rate of the number of grants, %
Western Balkans	Albania	7	9	28,57
	Bosnia and Herzegovina	9	10	11,11
	Kosovo	6	11	83,33
	Montenegro	7	11	57,14
	Serbia	17	18	5,88
Central Asia	Kazakhstan	10	9	-10,00
	Kyrgyzstan	4	7	75,00
	Tajikistan	2	7	250,00
	Turkmenistan	1	4	300,00
	Uzbekistan	3	11	266,67
Western Europe	Armenia	4	18	350,00
	Azerbaijan	3	13	333,33
	Georgia	3	19	533,33
	Belarus	4	13	225,00
	Moldova	9	9	0,00
	Ukraine	12	33	175,00
	Russian Federation	20	28	40,00
Countries of the Southern Mediterranean	Algeria	3	9	200,00
	Egypt	7	16	128,57
	Tunisia	6	16	166,67
	Israel	2	7	250,00
	Jordan	3	11	266,67
	Libya	4	12	200,00
	Morocco	9	20	122,22
	Syria	3	2	-33,33
Total	**76**	**171**	**125**	**255**

Source: built by the author [11]

4 Conclusions

Global experience of successful and, most importantly, profitable universities conducting research activity is of exceptional value for Ukraine. Especially in the context of the integration of national education to the global educational environment, as well as the security of the state qualified, experienced and promising human resources. At the national and local levels and activation requires solid support efforts to expand financial resources to shift from predominantly public funding for universities to attract financial resources from the private (business) and foreign sectors in the form of grants, sponsorship, patronage or other similar support in the implementation of R & D (research and development) activities.

Stable increasing volumes of funds from foreign and private sources for research activities is only possible if there is a public university recognition, its business reputation, significant scientific achievements and a high level of competitiveness of the institution on the world market of educational services (among other universities) in the community and in business.

Table 4 Changes in the number of grants received under the Student Fulbright Programl

Rank	University	2014-2015			2004			The growth rate of number of grants, %
		Grants	**Applications**	**Percentage of successful applications, %**	**Grants**	**Applications**	**Percentage of successful applications, %**	
1	Harvard University	33	160	20,63	20	98	20,41	65,00
2	University of Michigan-Ann Arbor	28	120	23,33	18	86	20,93	55,56
3	Northwestern University	27	124	21,77	8	51	15,69	237,50
4	University of Chicago	26	107	24,30	16	73	21,92	62,50
5	University of California, Berkeley	22	91	24,18	26	86	30,23	-15,38
6	Brown University	21	94	22,34	18	53	33,96	16,67
6	University of Pennsylvania	21	76	27,63	17	76	22,37	23,53
6	Yale University	21	106	19,81	24	76	31,58	-12,50
7	Princeton University	20	90	22,22	16	67	23,88	25,00
8	Rutgers, The State University of New Jersey	19	124	15,32	4	19	21,05	375,00
8	University of North Carolina at Chapel Hill	19	83	22,89	8	38	21,05	137,50
9	Duke University	17	63	26,98	17	50	34,00	0,00
10	Georgetown University	16	90	17,78	8	35	22,86	100,00
10	University of Minnesota	16	63	25,40	8	21	38,10	100,00

Source: built by the author [12]

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