

## INTERACTION IN THE INNOVATIVE SPHERE: RUSSIA AND CIS COUNTRIES

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**Abstract:** In article the relationship between participants of innovative process created in the territory of the states of the Commonwealth of Independent States (CIS) is considered. Are allocated with the author as the general tendencies inherent in the former republics of one country (Soviet Union), and their feature at this stage of development. In article the analysis of development of the innovative sphere of member countries of the Commonwealth is carried out: Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Uzbekistan, Ukraine. The author use system approach, comparative and statistical analysis in their work. In the paper conclusions about need of realization of integration approach with participation of the state, institutes of the scientific and educational sphere, manufacturing enterprises are drawn and also the perspective directions of development of member states of the Commonwealth come to light.

**Keywords:** innovations, research and development, integration, CIS

**JEL codes:** O32, O50

### 1. Introduction

Development of relationship between the state, science, education and the sphere of production on space of the CIS follows from the system of interrelations which has developed earlier, uniform for all republics of the Soviet Union. Speaking about the prospects of development of the sphere of interactions, we will note the general tendencies observed in member states of the CIS at this stage of functioning.

Economic growth of the state depends, first of all, on concentration of scientific potential on the perspective directions, competitive spheres of scientific and educational and technological activity allowing to resolve key issues of development of national economy. In the CIS countries it is possible to refer to them resource-and energy saving, nuclear technologies, ecology, nanotechnologies, telecommunications, biotechnologies and genetic engineering, physical and chemical bases of production and processing of raw materials. At the same time in the Commonwealth countries general scientific researches, but not developments giving commercial effect mainly prevail (exceptions: Russia, Armenia, Belarus) (table 1).

**Tab. 1** Distribution of internal current costs of research and development by types of works in 2015, %

Country	Internal current costs of R&D	Basic researches	Applied researches	Developments
Azerbaijan	100	52.2	21.2	2.6
Armenia	100	34.3	9.6	56.1
Belarus	100	14.2	26.1	59.7
Kazakhstan	100	29.5	54.1	16.4
Kyrgyzstan	100	53.1	10.2	36.7
Republic of Moldova	100	26.4	56.2	17.4
Russia	100	15.5	19.9	64.7
Tajikistan	100	62.7	21.6	15.7
Uzbekistan	100	22.6	41.8	28.8
Ukraine	100	24.6	16.5	47.8

Source: Science indicators (2017), p. 264

## 2. Methodology and Data

As basic research methods we used system approach, comparative and statistical analysis of indicative values of innovation and technological development of the Commonwealth of Independent States member countries.

In order to assess scientific and innovation potential since 2007 the Intelligence Unit of the Economist magazine calculates The Global Innovation Index annually (see table 2). Thus, in 2017 the research included 127 countries, which constitute 99.4% of the global GDP. The rating is headed by Switzerland with a score 67.69. Russia, occupying the 62nd place in 2013, reached the 45rd place in 2017.

**Tab. 2** The Global Innovation Index (CIS member countries), 2017

Country / Economy	Score (0-100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank
Russian Federation	38.76	45	UM	6	EUR	31	0.61	75
Ukraine	37.62	50	LM	2	EUR	33	0.83	11
Moldova. Rep.	36.84	54	LM	4	EUR	34	0.78	22
Armenia	35.65	59	LM	5	NAWA	8	0.80	17
Kazakhstan	31.50	78	UM	22	CSA	3	0.46	116
Azerbaijan	30.58	82	UM	25	NAWA	15	0.50	103
Belarus	29.98	88	UM	30	EUR	38	0.39	120
Tajikistan	28.16	94	LM	13	CSA	5	0.59	83
Kyrgyzstan	28.01	95	LM	14	CSA	6	0.47	114

Note: World Bank Income Group Classification: LI – low income; LM – lower-middle income; UM – upper-middle income; HI – high income. Regions are based on the United Nations Classification: EUR – Europe; NAC – Northern America; LCN – Latin America and Caribbean; CSA – Central and Southern Asia; NAWA – Northern Africa and Western Asia; SEAO – South East Asia, East Asia and Ocean.

Source: Compiled by the author based on data provided by The Global Innovation Index (www3)

## 3. Results and Discussion

In the CIS countries the main volume of basic researches carries out scientific research institute of public sector. So, in Azerbaijan and Armenia 96-99% of the general costs of basic researches, in Tajikistan and in Ukraine – 87%, in Russia – 76%, in Belarus – 69% fall to their share. The scientific organizations of a public sector in Azerbaijan, Armenia, Belarus, Kazakhstan, Moldova and in Ukraine have executed 55-66%, and in Tajikistan – nearly 100% of all applied researches. In the field of scientific and technical developments public sector plays the leading role only in Armenia and Tajikistan (95-100%) (Science and innovations, 2004-2015). Public sector occupies the greatest share among internal costs of research and development in Kyrgyzstan (90.4%) and Tajikistan (92.5%) (Science indicators, 2017).

The business sector is focused mainly on creation of the scientific and technical developments yielding commercial result. His share of a bike in Russia (67% of the general costs of research), in Ukraine (58%), in Belarus, Kazakhstan, Kyrgyzstan and Moldova (36-43%). In this sector in Moldova, Russia and in Ukraine 83-92% of the general costs of scientific and technical developments, in Azerbaijan, Belarus and Kazakhstan – 58-65% have been mastered. Besides, the organizations of a business sector in Russia have carried out 52% of the total amount of applied works, in Azerbaijan, Kazakhstan, Moldova and in Ukraine – 24-33%. Rather insignificant costs of basic researches in this sector (their share varied from 2 to 10%) were manufactured in Belarus, Kazakhstan, Russia and in Ukraine. The smallest share of a business sector among internal costs of research and development is observed in Kyrgyzstan (7.4%). The share of foreign sources is small in all CIS countries, but we observe the minimum percent in Azerbaijan and Tajikistan (0.2%), Kazakhstan and Uzbekistan (0.8%). Other national sources also occupy insignificant percent in all Commonwealth countries: in Kyrgyzstan, Tajikistan and Ukraine 0.2%, in Azerbaijan 1.7%, in Russia 1.4% (Science indicators, 2017).

In the countries of OECD more uniform distribution is observed. On average, indicators are distributed as follows: state sources of 30%, business sector sources of 60%, other national sources of 3%, foreign sources of 7%. However there are also exceptions. So, the prevailing share of the state is observed in Mexico (73.6%) and Greece (53.3%), a business sector – in the Republic of Korea (75.3%), Slovenia (68.4%), Germany (65.8%), Australia (61.9%). The share of foreign sources is minimum in Japan (0.4%), Mexico (0.5%), in the Republic of Korea (0.7%), and is maximum in Israel (48.8%), Luxembourg (32.3%) and in the Czech Republic (30.5%) (table 3).

**Tab. 3** Structure of internal costs of research and development on sources of financing in 2015, %

Country	Internal costs of research and development	State sources	Business sector sources	Other national sources	Foreign sources
CIS member countries					
Azerbaijan	100	67.6	30.5	1.7	0.2
Armenia	100	71.0	...	...	5.1
Belarus	100	48.3	43.8	...	7.9
Kazakhstan	100	63.7	28.9	...	0.8
Kyrgyzstan	100	90.4	7.4	0.2	1.0
Republic of Moldova	100	...	...	...	12.8
Russia*	100	69.5	26.5	1.4	2.6
Tajikistan	100	92.5	...	0.2	0.2
Uzbekistan	100	58.9	35.9	...	0.8
Ukraine	100	43.8	35.2	0.2	19.8
*Including budget funds, budgetary appropriations on the maintenance of the educational organizations of the higher education, sources of the organizations of public sector (including own).					
Countries of OECD					
Australia	100	34.6	61.9	1.9	1.6
Austria	100	36.6	47.0	0.5	15.9
Belgium	100	28.5	56.9	1.4	13.2
Great Britain	100	28.8	46.5	5.8	18.9
Hungary	100	33.5	48.3	0.7	17.5
Germany	100	28.8	65.8	0.3	5.0
Greece	100	53.3	29.8	3.7	13.2
Denmark	100	30.4	57.9	4.3	7.4
Israel	100	12.7	36.5	2.0	48.8
Ireland	100	24.6	54.5	1.1	19.8
Iceland	100	35.0	39.2	5.8	20.1
Spain	100	41.4	46.4	4.8	7.4
Italy	100	41.4	45.2	3.7	9.7
Canada	100	34.6	45.4	14.0	6.0
Luxembourg	100	48.4	16.5	2.8	32.3
Mexico	100	73.6	23.8	2.2	0.5
Netherlands	100	33.2	51.1	3.1	12.7
New Zealand	100	39.8	39.8	13.2	7.2
Norway	100	45.8	43.1	1.6	9.5
Poland	100	45.2	39.0	2.4	13.4
Portugal	100	46.4	42.3	5.2	6.1
Republic of Korea	100	23.0	75.3	1.0	0.7
Slovakia	100	41.4	32.2	2.7	23.7
Slovenia	100	21.8	68.4	0.6	9.3
USA	100	27.7	60.9	6.9	4.5
Turkey	100	26.3	50.9	21.8	1.1
Finland	100	27.5	53.5	1.7	17.3
France	100	35.2	55.0	1.7	8.0
Czech Republic	100	32.9	35.9	0.7	30.5
Chile	100	44.1	32.0	10.2	13.8
Switzerland	100	25.4	60.8	1.7	12.1
Sweden	100	28.3	61.0	4.1	6.7
Estonia	100	49.5	37.1	1.0	12.5
Japan	100	16.0	77.3	6.3	0.4

Source: *Science indicators* (2017), p. 259

If in Kazakhstan 31% of the total amount of basic researches, then in Belarus – 29%, in Moldova, Russia, Tajikistan and in Ukraine – 12–14% fell on a share of the universities, other educational institutions and also which are under their control or the scientific research institute associated with them. The share of applied

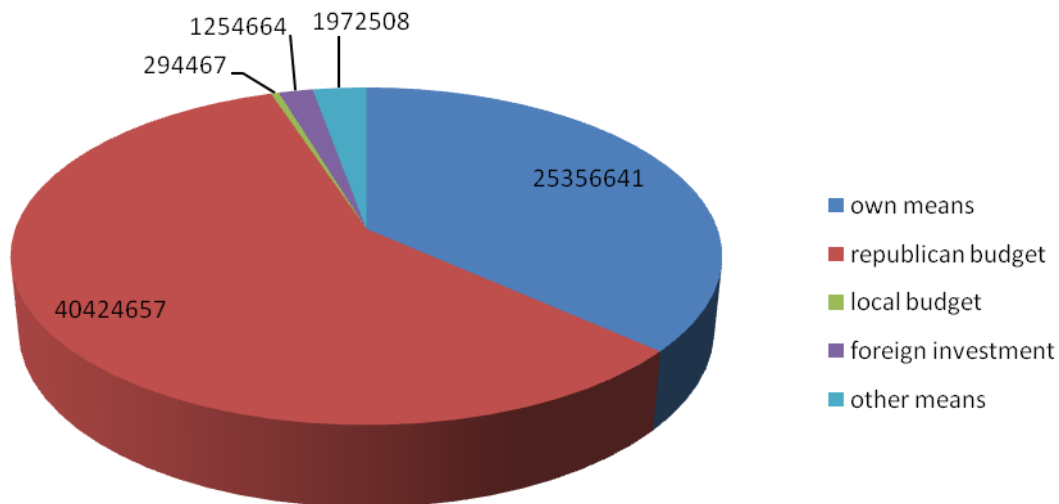
researches in Armenia made 42%, in Belarus – 20%, in Azerbaijan, Kazakhstan, Moldova, Russia and in Ukraine – 12–16% (Science and innovations, 2004-2015).

Practically in all states of the Commonwealth scales of the research and development which is carried out by the sector of the higher education it is less, than in the developed countries where in higher education institutions the main potential of fundamental and applied science is concentrated. In this regard cooperation of higher education institutions of the Commonwealth of Independent States countries in this sphere is represented especially important.

Separately it is necessary to allocate the scientific and professional organizations, charity foundations, public organizations which are engaged in research activity and representing the private profitless sector. These organizations practically didn't take part in carrying out research and development in the majority of the Commonwealth countries. Exception: Kazakhstan, Kyrgyzstan and Russia where by the organizations of this sector it has been executed from 0.1% to 1.3% of the total amount of research (Science and innovations, 2004-2015).

We will note that unlike the countries with the developed innovative economy, in the majority of the Commonwealth countries as a part of sources of financing of research works budgetary appropriations still prevail. At the advancing rates financing from the budget grew in Belarus, Kazakhstan, Moldova and Ukraine. In Kazakhstan a noticeable role in financing of scientific research is played by own means of the research organizations, in Ukraine – foreign investments (figure 1).

**Fig.1** Sources of financing of internal costs of research and development, thousands of tenges



Source: (www1)

We will note that increase in expenses on acquisition of the new equipment in scientific research institute and at the enterprises is observed in Kazakhstan, Kyrgyzstan, Tajikistan, however their technical equipment remains low that doesn't give the chance to compete in the world market of technologies and innovations. Therefore, only development and release of the modern scientific equipment can be organized by joint efforts.

In recent years process of modernization of the equipment within research took place insufficiently actively. So, in 2009-2014 capital expenditure corresponded to only 1.5-6.5% of the total amount of internal costs of research and development in the CIS countries. Specific weight of cost of cars, the equipment, devices in the total cost of fixed assets of research (design) activity fluctuated from 22% (Ukraine) up to 56% (Kazakhstan) (Science and innovations, 2004-2015).

Insufficient financing of scientific research and low level of the salary lead to the fact that in the majority of the states of the Commonwealth of Independent States (Armenia, Belarus, Kyrgyzstan, Moldova, Russia, Ukraine) outflow of experts from the sphere of science is continued.

In recent years in the majority of the Commonwealth countries the number of the experts conducting research and development, aged up to 40 years that demonstrates some rejuvenation of shots of science has grown up. At the same time the number of experts from 40 to 60 years was laid off and the number of researchers at the age of 60 years has increased and are higher.

Apparently from table 4, over a number of the countries of considerable changes in the number of employees of the scientific organizations hasn't occurred. The positive tendency can be noted in Azerbaijan,

Kyrgyzstan, Russia, Tajikistan. However in Belarus, Moldova and Ukraine considerable reduction of number of employees of the scientific organizations is noticeable.

**Tab. 4 The number of employees of the scientific organizations in the CIS countries (people)**

Country	Workers of the primary (scientific and technical) activity					Researchers				
	2007	2010	2013	2014	2015	2007	2010	2013	2014	2015
Azerbaijan	18079	17924	22358	23329	23329	11280	11037	15784	16337	16337
Armenia	5669	6558	5230	5627	5627	4114	4981	3870	4144	4144
Belarus	31294	31712	28937	27208	28937	18995	19879	18353	17372	18353
Kazakhstan	17774	17021	23712	25793	17586	11524	10870	17195	18930	12552
Kyrgyzstan	3140	3129	4241	4242	4242	2034	1974	3063	3013	3013
Moldova	4587	5114	4981	5038	4149	2592	3267	3250	3315	2655
Russia	801135	736540	727029	732274	833654	392849	368915	369015	373905	449180
Tajikistan	2410	2827	3389	3593	3389	1584	1802	2152	2332	2152
Ukraine	155549	141086	123219	109636	87390	78832	73413	65641	58695	46191

Source: *Statistics of science and education: the organizations and personnel which are carrying out research and development* (2015), p. 112; *Science Indicators* (2017), p. 269

Now the Commonwealth countries need formation of long-term programs for complex modernization of economy on the basis of increase in its scientific and technical level and transition to new technological way which center will be is nano- and biotechnologies and information and communication technologies. Modernization joint on space of the Commonwealth of Independent States of transport and power infrastructure, creation of the developed communication infrastructure, formation of effective national and transnational innovative educational system, development nano- and biotechnologies, modern medicine will become the leading direction to transition to innovative model of development of economy.

The information and communication sphere as one of the most dynamic and quickly developing, needs the corresponding legal regulation. So, in 2006 have been accepted by Council of Heads of Government the Strategy of cooperation of the State Parties of the Commonwealth of Independent States in the sphere of informatization and the Action plan for realization of Strategy (the project of new Strategy is already prepared now).

In 2008 Council of heads of states has accepted the Concept of cooperation of the State Parties of the Commonwealth of Independent States in the sphere of ensuring information security, and in 2010 the Council of Heads of Government has signed the Cooperation agreement of the State Parties of the CIS in creation, use and development of interstate network of the information and marketing centers for advance of goods and services on the national markets.

Active part in formation of a common information space is taken by Inter-parliamentary Assembly of the Commonwealth of Independent States. So far the Assembly has developed and adopted 12 model acts in this sphere, among them there are laws "About the Principles of Regulation of the Information Relations in the State Parties of the Commonwealth of Independent States", "About Cross-border Satellite Television both Broadcasting and International Satellite Information Exchange", "About Personal Data", "About the Digital Signature", "About Electronic Trading", the first part of the model Information code and other regulations, essentially important for this sphere (www3).

The Commonwealth of Independent States accepted by Inter-parliamentary Assembly in 2000 the model law "About the Digital Signature" has formed the basis of the similar Russian law of 2002, the Ukrainian law of 2003, similar legal acts of other State Parties of the CIS.

It should be noted that laws on the digital signature have created conditions for development of electronic trading within the Commonwealth countries in this connection the organization of the interstate centers witnessing digital signatures in various countries is important. So, for example, on the basis of experience of the interstate center created in South Korea witnessing digital signatures from China, Japan and South Korea similar activity between Russia, Ukraine and Belarus became possible.

Now, in the Commonwealth of Independent States are created and structures which meet the modern requirements of transition to an innovative way of development function. In particular, recently formed Interstate council for cooperation in scientific and technical and innovative spheres becomes the main authorized coordinator of scientific and innovative activity in the Commonwealth. Also he is engaged in development of the Interstate target program of innovative cooperation of the State Parties of the CIS until 2020.

On the basis of the Joint Institute for Nuclear Research in Dubna together with the Kurchatov institute, the International association of academies of Sciences with assistance of Interstate fund of humanitarian cooperation of the State Parties of the CIS the International innovative center of nanotechnologies of the CIS is created. Connect formation of the competitive hi-tech market of nanotech industry of the Commonwealth, creation of new instruments of scientific and innovative cooperation for joint entry into the world markets with his emergence.

In 2010 there were considerable changes in area of innovative cooperation. The Agreement on creation of the general information infrastructure of innovative activity of the State Parties of the CIS in the form of the general distributed information system and the portal of the Commonwealth of Independent States "Information for innovative activity of the State Parties of the Commonwealth of Independent States " has been prepared.

As the basic organization for interstate exchange of scientific and technical information the All-Russian institute of scientific and technical information of the Russian Academy of Sciences has been defined. Preparation of the draft of the Interstate target program of innovative cooperation of the State Parties of the Commonwealth of Independent States until 2020 has the same year begun.

During the same period the Framework programme of cooperation of the State Parties of the CIS in peaceful use of atomic energy until 2020 "Cooperation "Atom – the Commonwealth of Independent States" has been prepared. Base for such program is successful activity of the Russian nuclear sector which orders to mechanical engineering have grown by 25 times. The specified framework programme is directed to formation of partnership in the power sphere and creation of power and scientific and technical associations, and in the long term – the competitive atomic energy company of the Commonwealth of Independent States.

#### 4. Conclusions

Increase in efficiency of a transfer of technologies is promoted by formation of the necessary organizational system focused on ensuring process of receiving, realization and distribution of results of research and development with involvement of all participants of innovative process – the state, science, education, business. Creation of the system based on integration of scientific and educational and production spheres in countries of the Commonwealth of Independent States will promote formation of competitive hi-tech production, improvement of structure of export due to increase in a share of innovative production in it and decrease in raw orientation, to increase in the status of the countries in the world market of technologies.

In general, in realization of integration approach on space of the Commonwealth of Independent States it is possible to allocate the following most perspective directions of development.

1. Expansion of network of scientific and educational associations in the form of legal entities or on a contractual basis for implementation of educational programs and/or carrying out scientific research. It is possible to carry to them, for example, the centers of the advanced researches (the so-called centers of superiority) created by association of the most productive high school, academic and branch research teams with granting necessary resources to them and financed on a competitive basis.
2. Further development of the "design integration" aimed at formation of effective interrelations between higher education institutions, the scientific organizations and the enterprises. She promotes creation of steady alliances between scientific research institute, design offices, higher education institutions and the enterprises. This form is most attractive to business which can participate in joint projects in the sphere of science, innovations and training. Support of such integration doesn't mean refusal of formal merge of scientific research institute and higher education institutions, the issue of which has to be resolved on an individual basis.
3. Expansion of practice of joint participation of scientific research institute and higher education institutions in competitions on receiving grants and orders for research and development, in publishing, award of joint grants, the international programs and projects; the organization of the joint academic councils for the scientific directions, specialized councils for award of academic degrees on the basis of scientific research institute and higher education institutions. It will allow to create the environment favorable for any integration initiatives in scientific and educational community.
4. Creation, development and priority support of the leading research universities to network as largest scientific and educational organizations. As international experience testifies, such universities provide interrelation of values of fundamental education and opportunities of flexible satisfaction of needs for shots in the perspective scientific directions and high technologies.
5. Integration as organizational and economic process means first of all association of resources of scientific and educational complexes, including their innovative potentials, for obtaining social and economic and commercial effects. It assumes that the state will stimulate development of both simple, and more advanced its forms. To them, in particular, the innovative consortia uniting higher education institutions, the scientific organizations, the enterprises and, perhaps, financial structures treat with the subsequent formation on this basis of steady innovative clusters.

Development of the specified directions focused on interaction of participants of innovative process and integration of the Commonwealth of Independent States countries will promote formation of the effective scientific and educational complex providing the solution of the major social and economic tasks facing the state.

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