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NATIONAL INNOVATION SYSTEM IN UZBEKISTAN

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Abstract. The aim of present research is to study and evaluate the national innovation system in Uzbekistan and its components, capabilities, identify weaknesses and strength. Innovations and R&D has big impact for the change of economic situation and growth of economy as whole. Different statistical methods are used in the paper. The research object is the scientific research of national innovation system of Uzbekistan**.** The major tasks of the paper are describing the main features of national innovation system of Uzbekistan, comparison of European science, technology and innovation with Uzbekistan; evaluating the picture of national innovation system of Uzbekistan. In research the Eurostat database statistic data is used, only selected countries are included. The research shows the analysis of preconditions and barriers for establishment of Knowledge-Based Economy in Uzbekistan, and provides with recommendations for driving knowledge-based economy. The major findings, current state of the national system indicates that all the necessary formal elements that are still in the stage of its formation.

Keywords: innovation, national innovation system, innovation potential, R&D intensity, innovation activity, knowledge-based economy.

Introduction

In recent years, Uzbekistan began to actively consider the acceleration of innovation, as the main engine for sustainable economic development, advancing the development of innovative technologies and science in a number of key government priorities (Karimov I., 2008). Innovative development issues important not only for Uzbekistan but European Union too. However, the prospects of the development of the European Union largely depends on its innovation potential, therefore, the assessment of the innovation potential and possibilities and prospects of its further development is the basis for identifying and solving the significant social, economic and technological development problems. In the globalization the rise of innovations, stimulation of R&D activities and development of effectiveness become one of the most important factors which influence economic status and the prospects of economic development (Melnikas, Dzemyda, 2009).

The present article was mainly inspired by the results of a survey evaluating the potential and productivity of National innovation system of Uzbekistan conducted by United Nations Development Programme Uzbekistan and the Government of Uzbekistan (NISUzb, 2011). It directed for supporting the development of commercialization and transfer of technologies. In addition, project aimed assisting for creating long-term development program for the country. In addition to this survey, policy brief of Center of Economic Research of factors holding the development of High Education in Uzbekistan (2009) were completed as a specific up-to-date to our research.

Therefore, the purpose of this research is to study and evaluate the national innovation system in Uzbekistan and its components, capabilities, identify weaknesses and strength. Innovations and R&D has big impact for the change of economic situation and growth of economy as whole. Different statistical methods are used in the paper. The research object is the scientific research of national innovation system of Uzbekistan.

The major tasks of the paper consist of:

- describing the main features of national innovation system of Uzbekistan;
- comparison of European science and innovation with Uzbekistan;
- evaluating the picture of national innovation system of Uzbekistan.

The research shows the analysis of preconditions and barriers for establishment of Knowledge-Based Economy in Uzbekistan, and provides with recommendations for driving Knowledge-Based Economy, which consequently ensure sustainable growth of Uzbekistan in the XXI Century.

Investing in R&D

As soon as some countries in the world managed through effective innovation and industrial policy to achieve amazing results of economic growth (eg, Japan, South Korea, Taiwan, Finland, China etc.), increased interest in understanding of the mechanisms of influence technological innovations on economic growth. However, the study of innovation and their contribution to economic development is a challenge for both practical and theoretical point of view. For a long time innovative factor remained outside of econometric models, and attempts to include this factor in some sort of universal model has not yet led to a single conventional econometric model that takes into account innovation and technological development as a controlled growth factor (Чепель, 2010).

As a any form of economic activity, activation and commercialization of innovations requires significant financial expenditures. R&D is an activity involving significant transfers of resources among units, organizations and sectors and especially between government and other performers (Frascati Manual, 2002). In 2009 R&D expenditure as a percentage of GDP in Uzbekistan stood at 0.19 % (Report NISUz, 2011). If we compare this indicator with European Union countries (Eurostat 2011), we could see the wide disparities changes (Fig. 1).

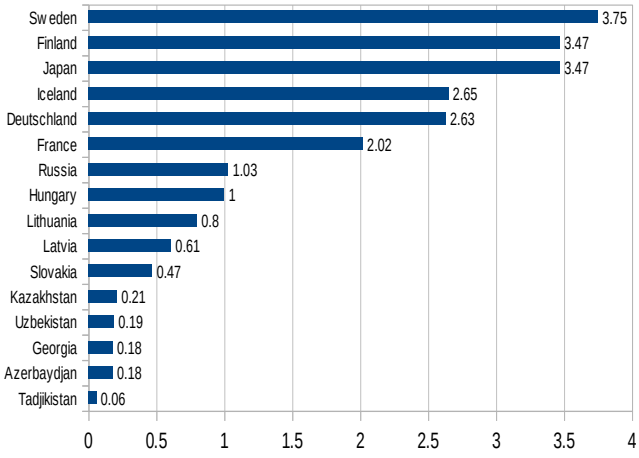

Fig. 1. R&D intensity (2008, in %)

Yes, R&D expenditures as a percentage of GDP are very low, to develop competitive innovation system. And if we give attention to the R&D expenditures year by year (Fig. 2.) (Report NISUz) We see that, last seven years R&D expenditures negatively decreasing. R&D expenditures decreased from 0.25 in 2003, to 0.185 in 2009 year.

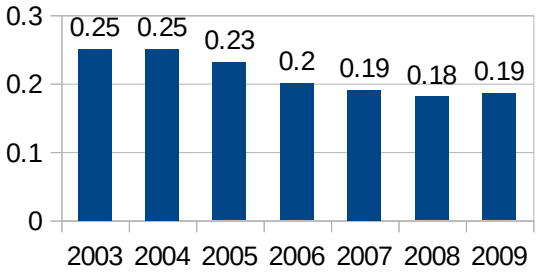

Fig. 2. R&D intensity (1998 – 2009, in %)

In Uzbekistan, 44.0% of R&D expenditure was financed by the government and 17,7 % by business enterprise sector(Report on NISUz, 2011). For comparison, there EU Member States achieved the second goal set by the Lisbon strategy of having two thirds of R&D expenditure financed by the business enterprise sector: Luxembourg (76.0%), Finland (70.3%), Germany (67.9%) (Eurostat 2011).

According to the research made by the Centre on improvement of anti-monopoly policy under the State Committee of the Republic of Uzbekistan (Аналитический отчет, 2007) on de-monopolization and support of competition the costs for R&D have been calculated for large and small businesses (Table 1).

Table 1. R&D expenditure of large enterprises in Uzbekistan (2009)

The share of expenditures	The share of enterprises
Less then 5%	31% (of the respondents)
0	25%
5-10%	23%
10-30%	19%

Table 2. R&D expenditure of small and private enterprises in Uzbekistan (2009)

The share of expenditures	The share of enterprises
Less then 5%	31% (of the respondents)
0	25%
5-10%	23%
10-30%	19%

The research showed that both large enterprises and small/private companies have almost the same share of

costs. Either the company spends less than 5 percent or even less on R&D, or do not spend at all (Table 1 and 2). The cost of patenting inventions and know-how are roughly at the same level. According to the conducted survey: to the question whether the firm had patent for know-how (an invention or innovation) during the last 5 years, 8% of responded firms answered affirmatively, and 86% had no practice of obtaining the patent, and 6% of respondents did not answer the question at all (Survey 2009).

Monitoring human capital

One of the key elements of the national innovation system is the availability of qualitative training system of personnel, which can provide innovative development. Also, there is a theoretically sound and empirical positive relationship between the level of human capital defined by as a complex of knowledge, skills and personal characteristics and technological progress (Richard R., Edmund S., 1966). In personnel training Uzbekistan implementing programmatic approach, in which reforms implemented at all stages of education (Национальная программа подготовки кадров, 1997). Government expenditures in Uzbekistan for education are relatively high 10,8% of GDP or approximately 50% of government budget.(Report NISUz, 2011). We can see total expenditure on education from 2000 to 2009 (Fig. 3).

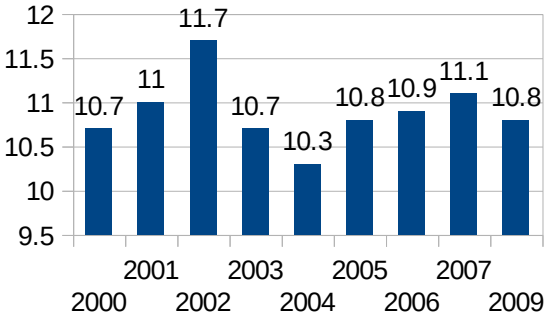

Fig. 3. Total expenditures on education expressed as a percentage of GDP

In terms of tertiary education as a percentage of population, see table 3. Lithuania, Finland and Poland is the top 3 countries, where more than 5,5 % of population are students. In contrast opposite trend was observed in Luxembourg and Uzbekistan.

Table 3. European Union selected countries and Uzbekistan tertiary education students as a percentage of population (own calculations)

	Country	Number of Students	Population	Students as a % of Population
1	Turkey	2,532,622	79,586,256	3.18
2	UK	2,329,494	61,191,951	3.81
3	Germany	2,245,138	82,217,837	2.73
4	Poland	2,165,980	38,115,641	5.68
5	France	2,164,538	64,007,193	3.38
6	Italy	2,013,856	59,619,290	3.38
7	Spain	1,781,019	45,283,259	3.93
8	Finland	309,648	5,300,484	5.84
9	Lithuania	204,767	3,366,357	6.08
10	Sweden	406,879	9,182,927	4.43
11	Norway	212,672	4,737,171	4.49
12	Luxembourg	2,979	483,799	0.62
13	Uzbekistan	286,222	27,313,700	1.05

One of the important human capital indicators is R&D personnel data. R&D personnel measure the resources going directly to R&D activities (Table 4) (Eurostat, 2011).

Table 4. R&D personnel by country as a percentage of population, 2008

	Country	R&D personnel	Population	R&D personnel as a % of Population
1	China	1,740,000	1,325,000,000	0.13
2	Japan	937,865	127,568,000	0.74
3	Russia	869,772	142,008,838	0.61
4	Germany	517,000	82,217,837	0.63
5	France	372,326	64,007,193	0.58
6	UK	358,284	61,191,951	0.59
7	S. Korea	269,409	48,606,800	0.55
8	Italy	236,261	59,619,290	0.40
9	Spain	215,676	45,283,259	0.48
10	Netherlands	88,723	16,445,600	0.54
11	Sweden	77,549	9,182,927	0.84
12	Poland	74,596	38,115,641	0.20
13	Turkey	63,377	79,586,256	0.08
14	Finland	56,698	5,300,484	1.07
15	Uzbekistan	26,145	27,313,700	0.10
16	Lithuania	12,632	3,366,357	0.38

In 2008, by R&D personnel head count, China was the leader with 1 740 000 personnel, followed by Japan 937 865 and Russia 869 772 R&D personnel. R&D personnel as a percentage of population at national level, the highest figures were in Finland (1.07%), Sweden (0.84%) and and Japan (0.74%). The lowest figures are Turkey (0.08%), Uzbekistan (0.10%) and China (0,13%).

Productivity and competitiveness

In order to improve the measurement of the evolution and performance of the knowledge-based economy, indicators are needed of the stocks and flows of knowledge. Patents, since they represent ideas themselves, are the closest to direct indicators of knowledge formation; of all the traditional knowledge indicators, patents most directly measure knowledge outputs (rather than inputs).

Patent data have certain advantages in that most countries have national patent systems organized on centralized databases, the data cover almost all technological fields, and patent documents contain a large amount of information concerning the invention, technology,inventor, etc (OECD, 1996).

In 2009, at world level the highest numbers of patent applications were recorded in the Japan (295 315), China (229 096) and Korea Rep.(127 316). In terms of patent applications per million inhabitants, Korea Rep. Was in the lead (2614.3), closely followed Japan (2314.4) and Germany (584.4). The lowest indicators were in Lithuania (27.6), Uzbekistan (8.6) and India (4.6) (Table 5).

Table 5. Patents application filled, total number per million inhabitants, selected countries, 2009

	Country	Patent applications Filled (2009)	Population (2009)	Patents per million Inhabitants
1	Japan	295,315	127,600,000	2314.4
2	Germany	47,859	81,900,000	584.4
3	France	14,295	62,600,000	228.4
4	UK	15,985	61,800,000	258.7
5	S. Korea	127,316	48,700,000	2614.3
6	China	229,096	1,331,500,000	172.1
7	Russian Fed.	25,598	141,900,000	180.4
8	Spain	3,596	46,000,000	78.2
9	Sweden	2,549	9,300,000	274.1
10	Singapore	750	5,000,000	150.0
11	Netherlands	2,575	16,500,000	156.1
12	N. Korea	7,956	23,900,000	332.9
13	Italy	8,814	60,200,000	146.4
14	Iran	5,970	72,900,000	81.9
15	India	5,314	1,155,300,000	4.6
16	Finland	1,806	5,300,000	340.8
17	Lithuania	91	3,300,000	27.6
18	Poland	2,899	38,100,000	76.1
19	Uzbekistan	238	27,800,000	8.6

One of the main indicators of innovation activity is the amount innovative production. In 2009, Uzbekistan produced 119 033 622.48 US dollar innovative production. It increased 125.3% thank previous year. But innovative production exports decreased 55,7% than 2008 year, due to engineering, metalwork and construction and education. Approximately 80% of exported innovative productions were produced in engineering and metalworking.

High-technology exports of selected countries in 2009 China was the leading exporter of high-tech products 258 777 EUR million, followed by the Germany 122 304 EUR million and Singapore 83 854 EUR million. The lowest high-tech exporters from selected is Lithuania 1 048 EUR million, Turkey 1 301 EUR million and Uzbekistan 1 437 EUR million (Table 6.).

Table 6. High-technology export (in EUR million, selected countries, 2009)

		Export	
	Countries	EUR million	as a % of Total exports
1	China	258,717	26.6
2	Japan	86,360	16.3
3	Russia	3,718	1.2
4	Germany	122,304	12.4
5	France	66,898	16.4
6	UK	47,231	15.1
7	S. Korea	76,302	28.2
8	Italy	21,767	6.0
9	Spain	7,966	4.2
10	Netherlands	70,089	16.2
11	Sweden	16,872	13.5
12	Poland	4,950	4.3
13	Turkey	1,301	1.5
14	Finland	11,366	17.3
15	Uzbekistan	1,437	11.6
16	Lithuania	1,048	6.5
17	Singapore	83,854	36.5
18	Switzerland	28,325	20.8
19	Hungary	14,930	20.2

Conclusions

Uzbekistan has an enormous innovative potential in agriculture, industry, healthcare and pharmaceutics, IT and communication and in biotechnology. But it is complex problem to realize and diffuse this potential. For further development and generation of this potential, proposed:

1. However, despite the well-developed scientific base, it is early to speak about high effective national innovation system. 44.0% of R&D expenditure was financed by the government and 17,7 % by business enterprise sector (Report on NISUz, 2011). For comparison, there EU Member States achieved the second goal set by the Lisbon strategy of having two thirds of R&D expenditure financed by the business enterprise sector.

2. In terms of human capital, tertiary education as a percentage of population, (see Table 3.). Lithuania, Finland and Poland is the top 3 countries, where more than 5,5% of population are students. In contrast opposite trend was observed in Luxembourg 0.62% and Uzbekistan 1.05%. Tertiary education is the basis of knowledge-based economy Uzbekistan has to rethink and expand educational potential. Qualitative training system of personnel provides innovative development.

3. R&D personnel as a percentage of population at national level, the highest figures were in Finland (1.07%), Sweden (0.84%) and and Japan (0.74%). The lowest figures are Turkey (0.08%), Uzbekistan (0.10%) and China (0,13%)(see Table 4.). We can see large disparities for example with Finland (1.07%) and Uzbekistan (0.1%). Importance of this indicator is human capital is the essential factor and driver of knowledge-based economy.

In terms of patent applications per million inhabitants, Korea Rep. Was in the lead (2614.3), closely followed Japan (2314.4) and Germany (584.4). The lowest indicators were in Lithuania (27.6), Uzbekistan (8.6) and India(4.6) (see Table 5.). Also shows weakness of innovative system.

The study of the current state of the national system indicates that all the necessary formal elements that are still in the stage of its formation. However, assessment of baseline development and innovative tools supporting and encouraging innovation, detects the presence of a number of issues that is critical for innovative development.

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NACIONALINĖ INOVACIJŲ SISTEMA UZBEKISTANE

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Santrauka

Staipsnis skirtas Uzbekistano nacionalinės inovacijų sistemos komponentų ir potencialo nagrinėjimui ir vertinimui, nustatant

jos silpnasias ir stipriasias puses. Inovacijos, moksliniai tyrimai ir ekperimentinės plėtros darbai turi didelę įtaką ekonominės situacijos pasikeitimui ir šalies ekonomikos augimui. Situacijos tyrimui panaudoti įvairūs statistiniai metodai. Tyrimo objektas – moksliniai tyrimai, skirti Uzbekistano nacionalinės inovacijų sistemos nagrinėjimui. Šios publikacijos uždavinys – nacionalinės inovacijų sistemos būklės įvertinimas, apibūdinant pagrindinius Uzbekistano nacionalinės inovacijų sistemos aspektus ir palyginant Europos ir Uzbekistano švietimo, mokslo, technologijų ir inovacijų sistemas. Tyrime panaudojami Eurostat statistiniai duomenys, charakterizuojantys atskirų šalių situaciją. Straipsnyje taip pat nagrinėjamos inovacijų ekonomikos sukūrimo Uzbekistane prielaidos ir nustatomi trūkdantys tam barjerai; pateikiamos rekomendacijos grindžiamos žinioomis ekonomikos sukūrimui. Svarbiausia tyrimo išvada yra ta, kad visi minėti formalūs nacionalinės inovacijų sistemos elementai dabartiniame etape yra tik užuomazgos lygyje.

Reikšminiai žodžiai: inovacijos, nacionalinė inovacijų sistema, inovacijų potencialas, moksliniai tyrimai ir ekperimentinės plėtros darbai, žiniomis grindžiama ekonomika.