The interaction of science, education and production in the modern world

Alfia Gazizova
Kazan Federal University
Naberezhnye Chelny Branch, Russia
Alfgazva@mail.ru

The interaction of science, education and production has always been an important issue on the agendas of academics and policymakers. It has become even more significant with the increasing integration of global economy, orientation of many nations to the creation of innovative society.

Given approaches in comparative researches we have focused on the relationship between high school and the business sector in rapidly developing countries, members of G-20, such as Turkey and Russia. Turkish and Russian economies are undergoing a structural transformation in which innovative capabilities play an increasingly important role. The ongoing transformation is changing the skill needs of the business sector and their expectations from high school graduates and scientists. It is obvious to make progress both countries need to invest in the skills of the labor force, to improve the quality of higher education, to conduct joint researches and studies with business community, to develop scientific and technological infrastructure providing effective interaction of science, education and production.

Despite similar goals, Turkey appeared to show more dynamic changes to meet the requirements of economy, labor market and active development of private-state partnership. The reference to the international experience, comprehension of own private experience in comparison with other one is of special interest for Russia. It allows to see the most effective samples of academic and scientific activity for Russian system, versions of common problems decision, stimulates the emergence of new ideas and priorities for own policy and reforming practice.

So favorable conditions and prerequisites to achieve competitive advantages in Turkey are connected with various factors including 1) development of new industries, 2) growth of the economy and the initiatives of business community in research activities; 3) adoption of national policy and state support of innovative activity through tax postponement for R&D expenses, grants, creation of joint

centers; intensive development of innovation infrastructure; funding of research projects for industrial purposes; 4) Turkey's membership in international organizations, such as the World Trade Organization and the EU Customs Union and active participation in their scientific and economic programs, 5) the growing number of universities and improvement of their research infrastructure.

Business sector in Turkey makes important contributions to the development of university science, funding level accounts for 15- 22 %, that exceeds the similar investments in developed countries (Canada, Belgium, Germany)[1]. Business community also participate investing in higher education through creating universities, governing high schools, providing academic processes (through introduction of a wide range of courses covering the topics related with technology and innovation management, involving the students into projects, execution of master's and doctor's dissertations in real manufacture conditions etc.).

Thus, the state stimulation of interaction in Turkey is initially connected with various government programs supporting scientific projects. In Russia the state «program» of innovative process stimulation is characterized by insignificant financial investments, absence of advancing legislative and organizational support, branch orientation of the most programs that doesn't facilitate cooperation of innovative infrastructures created by various departments and funds[2].

In the last 15-20 years one can observe strengthening of Turkish university role and position in development of scientific and innovative system as a whole despite historically formed difficulties (such as absence of fundamental science, narrow sector of higher education, training-orientated universities, absence of strong quality assurance system, limited institutional autonomy, etc.). As for the detailed indicator treatment Turkish university sector unlike Russian one shows the appreciable advance in performing research and consequently the strengthening of its position in the field of global academic ratings.

For example, in 2003 Turkish academics published a total of 12.751 articles in journals covered by the three citation indices. This accounted for 1.1% of the global publications, and put Turkey in the 22nd place in the world in terms of publications in SCI journals[3]. In 2007 the number of articles has increased to

[1] Education and society: whether Russia is ready to invest to its future? = Образование и общество: готова ли Россия инвестировать в свое будущее? [Electronic resource]: The Report, Moscow 2007 / Public chamber of the Russian Federation. – Mode of access: http://www.hse.ru/temp/2007/files/20071220_ eport.pdf

[2] Majburov I. High school and the industry: aspects of mutual relations = Высшая школа и промышленность: аспекты взаимоотношений / I.Majburov// The high school Bulletin. = Вестник высшей школы. – 2003. – No.9. – P.3-9.

[3] Guruz K. The Turkish experience in higher education governance and reform / K. Guruz // International Conference on Higher Education and Scientific Research in Knowledge Based Societies (February 24–25, 2007). – Sofia : New Bulgarian University, 2007.

21.779[4] that puts Turkey in the top countries in the world. Today Turkish scientists represent more than 60 % of the international scientific publications from the Muslim countries[5]. These results correlate with the Project Vision 2023. The objective of the project has been set as formulation of new national science and technology policies and setting priority areas for the next couple of decades in order to create a prosperous society and economy based on innovation by 2023, the 100th Anniversary of the Turkish Republic.

These achievements are caused, first of all, by the increase of high school science funding, secondly, by the conduct of majority scientific researches at universities and, thirdly, by the primary attention to research activity that is expressed in direct dependence of teacher's career on scientific work and especially on number of personal publications. The priority to scientific work has certain negative consequences (theoretical orientation of workings, etc.), however it leads to notable quantity indicators.

In Russia the cited approaches aren't practically developed, cooperation between universities and business sector is at the primary stage initiated more likely by high schools rather than the enterprises by inertia preferring a traditional way of development. They don't show obvious desire to establish relations with universities and make contribution to scientific workings.

Compared to the international experience underestimation of Russian high school science development is especially visible. The majority of schools are education-orientated; their contribution to a science remains insignificant. The most part of public funds is realized by academic (the Russian Academy of Sciences and other academies) and applied (branch scientific research institutes) scientific spheres. We quote some data as an example: number of the higher educational institutions carrying out researches and workings in 1990–2005гг. has decreased from 453 to 406 that makes only 11% of total scientific organizations. By the beginning of 2006 researches were conducted only in 7% Russian high schools[6]. The main reasons for that in many respects relate to insufficient level and mechanisms of state funding; decrease of teaching staff involved in researches.

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[4] ERAWATCH Country Report 2009. Turkey [Electronic resource] : Analysis of policy mixes to foster R&D investment and to contribute to the ERA / European Commission ; by Sirin Elci, Ihsan Karatayli. – Mode of access: http://cordis.europa.eu/erawatch/index.cfm?fuseaction= reports.content&topicID= 600&parentID=592

[5] Kağitçibaşi Ç. Science on the rise in Turkey [Electronic resource] / C. Kağitçibaşi. – Mode of access: http://users.ictp.it/~twas/pdf/NL15_2_PDF/06-Turkey_24-27_low.pdf.

[6] Majburov I. High school and the industry: aspects of mutual relations = Высшая школа и промышленность: аспекты взаимоотношений / I.Majburov// The high school Bulletin. = Вестник высшей школы. – 2003. – No.9. – P.3-9.

At the same time in Russia despite the unfortunate trends connected with inefficient economic reforms, favorable ones still remain that allows to develop science at high institutions. They have deep historical roots and old tradition of high school contribution to the development of scientific potential of Russia. Creation of collective system concerning production and use of knowledge in Russia is linked now with re-structuring of high school through singling out federal and national research universities called to become the backbone factor for the effective education-science-production interaction[7], also with the creation of innovation complex «Skolkovo».

There is no doubt that qualified specialists are a major incentive for firms to innovate and produce high-tech goods. And one of the main tasks for governments is to place innovation, creativity and innovative entrepreneurship at the heart of national education systems.

It is an essential prerequisite to a technological progress and economic success in Turkey where education and skill levels lag international standards. Almost 60 percent of the Turkish workforce in the manufacturing sector has less than ten years of education, compared with 9 percent in Bulgaria, 27 percent in Vietnam, 33 percent in Chile, and 40 percent in Poland , and only 10% has higher education[8].

Meanwhile firms in Turkey, as in Russia, see a real need for foreign language skills, especially English, computer skills, analytical skills, social, behavioral and communications skills. They also cite a lack of practical experience among many graduates that restrains promotion of innovative projects. The skills highlighted by Turkish firms are similar to skill needs in other countries including Russia. However the results are indeed unsatisfied, tertiary education in Turkey remains elite. The desire and demand to expand higher education is strong, but the choices are complex and the financial implications significant for individuals and government.

Government strategies place a high priority on reforms by focusing on access and equity issues and the relevance of tertiary education to the labor market. Other steps concern the system integration of the Turkish higher education into the European structures according to Bologna reforms that is also of special interest for Russia.

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[7] Majburov I. High school and the industry: aspects of mutual relations = Высшая школа и промышленность: аспекты взаимоотношений / I.Majburov// The high school Bulletin. = Вестник высшей школы. – 2003. – No.9. – P.3-9.
[8] Turkey–Higher Education Policy Study. Volume I. Strategic Directions for Higher Education in Turkey [Electronic resource]: Report No. 39674 – TU, June 2007 / The World Bank. – Mode of access: http://siteresources.worldbank.org/EXTECAREGTOPEDUCATION/Resources/444607119 2636551820/Turkey_Higher_ Education_ Paper_062907.pdf.

So the interaction of science, education and production in the modern world is one of the effective tool of a sustainable development and national competitiveness and our reference to the Turkish experience may be useful in solving many common actual problems such as promotion of active private-state partnership in professional training, rise of university research potential and quality culture, intensification of the international cooperation in scientific and academic spheres.