

Integration of Universities and Business as the Condition of Formation of the Innovative Economy

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Abstract—World economy is experiencing a global economic crisis. During such periods, the world economic structure and leader-countries are changing, new economic centers are appearing. Authors explore the causes of the global economic crisis and show changes in the present structure of world economy. Also substantiated the efficiency of using the strategy of catching up on the example of developing countries.

Today Russia has a unique chance for technological upgrading by large-scale deployment of efficient technologies already developed by the leaders. Based on global experience, the strategy to modernize the Russian economy should be combined: a strategy of leadership in the areas where Russia has the technological superiority, the strategy of catching up and borrowing in industries where there is a considerable lag. To gain this goal Russia first of all has to increase effectiveness of cooperation of the state, universities (of science and education) and business – the three basic factors of innovative system.

Index Terms—global crisis, innovation pause, strategy of catching up, modernization, integration of universities and business

I. INTRODUCTION

The world economy still suffers the consequences of the global economic crisis of 2008-2010. The leading indicators of the state of national economies cannot anyhow come to a before-crisis level. The decrease in production is observed not only in the developed countries, but in a more successful China as well. The economy growth rate of Russia has slowed down to 3.5%. The economic situation of Russia is worsened by the fact that during the last ten years it existed mainly at the expense of raw-material revenue. Current revenues and foreign credits were invested in the related industries (sectors) and caused demand for consumers' goods, services and housing. Inner growth mechanisms have not been created. Meanwhile, at the present moment when the world economy suffers an innovation pause, Russia has got a chance to occupy a rightful place in the world economy. To gain this goal Russia first of all has to increase effectiveness of cooperation of the state, universities (of science and education) and business – the three basic factors of innovative system.

II. MAIN RESEARCH

The majority of scientists explain contemporary state of world economy from the positions of the theory of economic cycle, which originates from the economists, as Joseph Schumpeter, Nikolai Kondratiev and Simon Kuznets. This theory represents the process of development of world economy in terms of consistent substitution of large complexes of technologically linked industries, i.e. technological modes (TM). Basic innovations or general purpose technologies become economic growth engine. The notion 'basic innovations' was introduced by G. Mensch [1], later the notion 'general purpose technologies' [2] started to be used, which differ from ordinary innovations because first of all they have the wide sphere of application and with relevant modification arouse the whole tree of new technologies. However, the sphere of possibilities of each basic innovation is limited, the effectiveness of secondary innovations in time decreases.

For example, today informative technological mode is close to the limits of its growth and now it is in the finishing phase of its life cycle. During this period the reduction of investments in production of dominating technological mode leads to the considerable redundant capital, which seeks for the sphere of application, and this causes gestation of financial bubbles on the stock, raw materials and real estate markets. All these cause the financial crisis, during which there happens reorientation of speculative investments on fixed assets. Then overcoming of crisis phenomena begins and first of all it happens by means of formation of the core of a new technological mode.

The above stated concept is confirmed also by the hypothesis about innovations pause being in process now. Innovations pause happens because of the fact that the intensity of the secondary innovations flow generated by current basic innovations has considerably dropped, and new basic innovations have not emerged yet.

As a rule, basic innovations are created by the state in coordination with large enterprises. That is why closing up of stock markets and nationalization of large corporations can be observed as the preparation stage of western economies for a new innovation breakout.

The preceding to the crisis jump in prices on energy sources and raw materials has led to a sharp fall in profitability of production in technological complexes of the dominating technological mode. This signaled to

mass implementation of principally new, less energy consuming and less raw material intensive technologies. For example, the member of Club of Rome, honorable professor of the six European universities, the author of the book "Factor 5" Ernst von Weizsäcker considers that new economic cycle will be "green", as its basic innovations will be based on resource-saving technologies.

In conditions of innovation pause there appears an opportunity for the countries of speedy development by means of quick formation of core technological complexes of a new technological mode, and by modernization of its key industries. At the present moment when its path has not been formed yet and there is a competition of alternative technologies, the developing countries are aiming at gaining leadership on perspective directions of the new technological mode and by that strengthen their positions in the world economy.

Nowadays on the top of the world technological pyramid there is a rather small group of developed countries as the USA, Japan and leading EU countries. The second level is occupied by the countries – candidates for increasing their technological status (China, Asian Dragons, India, Brazil and some EU countries). The third level is represented by 2-3 dozens of undecided countries and the fourth level is occupied by the countries which do not have real chances for technological up-grade or which are the acceptors of the secondary technologies. Experts refer Russia with great advance to the 2nd group.

Developing countries solve the problem of overcoming technological backwardness by means of concentration of resources on breakthrough directions of the new technological mode, multiple increasing in innovative and investment activity, which provide new quality of economic growth.

Today the most dynamically developing world economy is China. According to the International Monetary Fund's forecast even the growth rate reduction of per capita GDP of China (for 8.8%) during forthcoming five years will not deprive it the status of the most dynamically developing economy of the world. Next after China comes India – per capita GDP growth according to International Monetary Fund will equal 6.6% in next 5 years. Progressive economic growth will allow it to strengthen its weight in global economy from 2% in 2009 to 13% in 2050. Namely India is investing today in nanotechnologies, which gives it a chance to gain leadership in many key spheres of the new technological mode. The percent of developing Asian economies by 2050, they consider, will be almost 50% from the world GDP, whereas the percent of EU countries will decrease from 19% (in 2010) to 7% [3].

According to the USA National Science Fund's report the general volume of global export of hi-tech products (means of communication, semiconductors, computers and office equipment, pharmaceuticals, aerospace industries) exceeded 3 trillion dollars in 2009 (3 times more than in 1995). The main products volume about 2/3 came for telecommunication, semiconductors and computer products. The percent of the USA, the former leader, fell from 21% in 1995 to 14%. The percent of Japan also fell from 18% to 8%. China has become a new world leader in the world hi-tech trade having increased its rate from 6% to 20%. From the five main categories of

hi-tech production the USA leads only in aerospace industry (50%), EU countries lead in pharmaceuticals (40%) and in producing science instruments and equipment (23.5%). China has gained 40% of computer market and office equipment and 22% of telecommunication equipment and semiconductors export.

From the stated above it is clear that world economy has entered the new phase of its development where the tone will be set by the countries which during the 20th century were considered to be on the periphery of the world economy and which managed to use effectively their chance that appeared during the period of technological modes changing.

Unfortunately, the present economic state of Russia does not allow distinguishing it as the candidate for the leading role in the world economy. Russia's GDP today amounts 31-32% from the USA rate, which is 2.5 times lower than the corresponding rates of England, France and Germany. According to the rating agencies forecasts Russian economy will grow for 4% a year, which will give it opportunity to occupy 15th place by 2050, though the spread between the leaders and Russia during these years will only increase.

During last year's Russia has existed due to the increase in raw materials revenue. The mechanisms of inner growth have not been created. Arranging countries according to the indexes characterizing the effectiveness of innovative activity has confirmed a low level of Russia's innovative activity. Today Russia occupies the 46th place according to the innovations' effectiveness; meanwhile China has the 3rd position, India – the 9th, Germany – the 13th and the USA – the 26th. The general innovative index of Russia has at all the 51st range [4]. And this despite the fact that Russia was the member of elite technological club up to the 90s of the last century.

The national innovative system of Russia today is misbalanced. Its core elements, such as science and educational institutions, industrial enterprises, innovative infrastructure exist independently from each other; there is no cooperation mechanism between them.

The project of development and renovation of Russia's transport infrastructure can become a powerful locomotive of innovations development and one of the centers of crystallization of innovative activity. Progressive foreign countries experience of creating technological platforms based on combination of three factors: apparent demand, intellectual capital and new foreign technologies can be effectively introduced particularly in the sphere of road construction.

The above mentioned is being practically realized for several years already by the "Road construction machinery" department of Kazan State University of Architecture and Engineering. The department has created on its platform international educational center of transfer of modern technologies into the sphere of road construction in cooperation with German Wirtgen company, exclusive dealer – Swedish company Volvo "Ferronordic Machines" Ltd., Chinese companies Guilin Huali Heavy Industries Co. Ltd. and Xuzhou Construction Machinery Group Co. Ltd. International educational center regularly holds international seminars and meetings with leading foreign specialists for the managers of road industry enterprises of Republic of Tatarstan (Fig. 1).

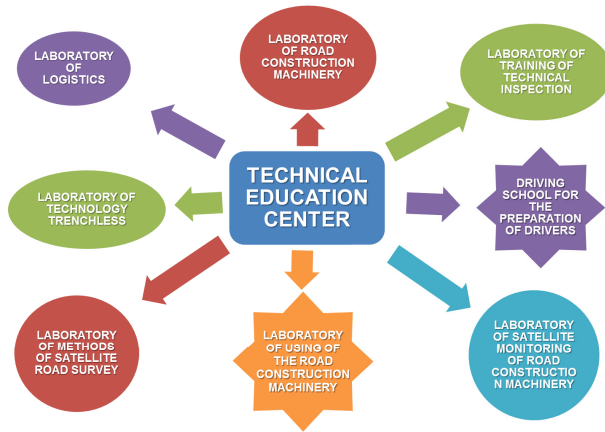


Figure 1. The Scheme of the Center.

Telecommunicational technologies and interactive methods of education are widely used by the department for gaining effectiveness of integrational processes and increasing the quality of education.

Formation of student's portfolio, usage of case-technologies, creation of focus-groups, realization of business and role plays, case-study and on-line testing play a significant role among interactive methods. After practicing abroad, students defend their reports in on-line mode, creating participation effect of the host party.

The department actively develops education by means of network resources, which broadens interaction between students and teaching staff, provides dialogue exchange between the participants of the educational process in on-line and off-line modes. Synchronous holding of interactive courses with instructing in on-line mode, as well as with the further asynchronous discussion, is actively practiced in the process of teaching.

Wirtgen Company representatives hold lectures about modern world tendencies in the development of road construction industry for students and specialists, who upgrade their skills in the International educational center. During educational seminars video conferences, round tables, on-line debates and discussions, forums for business as well as for informal communication are held both with Russian representatives of road construction industry and foreign partners.

Qualification upgrading courses are constantly held on the platform of the department, where exploitation peculiarities of foreign road construction machines of such companies as Wirtgen, Voge, Hamm, Volvo are studied, and machines of modern trenchless technologies of horizontal directional drilling are observed. Information technologies are actively used in this process.

During summer practice the best students of road construction department visit Wirtgen Group plants such as: Kleeman, Hamm, Voge and Wirtgen. They study structures of modern road building machines, and in practice learn about the newest technologies of roads laying in Germany. But the most important thing is that the students in the production departments of the mentioned above plants get acquainted with the newest methods and ways of producing and assembling of these machines. By this way they solidify their knowledge received during the courses "Machine Details and Elements of Mechanical Design", "Theories of

Mechanisms and Machines", "Carrying and Lifting Machines", etc.

The "Road construction machinery" department has also a signed agreement with China University of Geosciences – Wuhan and Xuzhou Construction Machinery Group Co. Ltd. plant about creating a course "Appliance of Trenchless Technologies in Construction" aiming at studying and using progressive experience. For example, Xuzhou Construction Machinery Group Co. Ltd. formed a classroom on the "Road building machines" department's platform and equipped it with necessary joints and instruments as demonstration aid and with basic installation schemes for thorough studying. China University of Geosciences – Wuhan sends its specialists to the overall trenchless technologies and horizontal directional drilling areas for holding training and educational seminars and conferences to exchange experience.

International educational center supports practice of collaborative participating of higher-education teaching staff in contests for gaining orders for investigations and project engineering, in international programs and projects, which allow forming environment favorable for integrative processes in scientific-educational community.

Today the "Road construction machinery" department is discussing plans of creating in the nearest future road technical park "The Roller", the main aim of which will be increasing innovative activity in the road building industry, creating new transfer channels of progressive technologies, increasing effectiveness of instruments application for supporting innovative business (Fig. 2).

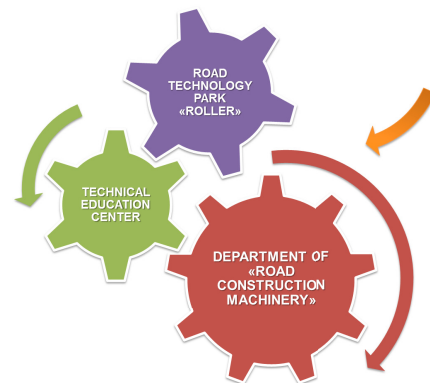


Figure 2. The Scheme of the Department Development.

The determining factor of successful realization of planned projects is the availability of scientific research sub departments of Kazan State University of Architecture and Engineering, high level of intellectual potential of its teaching staff and graduates.

III. CONCLUSION

On the basis of world experience the strategy of modernization of Russia's economy should combine: strategy of leadership in the spheres where Russia has technological advantage; strategy of catching up development and borrowing in the spheres where there is considerable under run. It is necessary to use technological policy combining both marketable and non-marketable channels of technologies transfer. The necessary approaches of successful modernization of

PAPER

INTEGRATION OF UNIVERSITIES AND BUSINESS AS THE CONDITION OF FORMATION OF THE INNOVATIVE ECONOMY

Russian economy can be the following: real estimation of its possibilities, understanding of applying western technologies before counting on innovations, gradual development of institutions and institutional environment, admitting the priority of economic processes over geopolitics. In connection with this Russian educational system has the task to prepare specialists qualified for the requirements of the world standards, ready to apprehend the progressive achievements of world science and practice.

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