

# HIGHER EDUCATION REFORMS AFTEREFFECTS: INTEGRATION WITH ACADEMIC SCIENCE INSTITUTES AND EXAMPLES OF LOCAL SUCCESS

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Institutions of higher education together with academic institutes have established a network of innovation structures in several Siberian regions. However upcoming conversion of fundamental knowledge into specialist training and starting new products and businesses is surely subject to substantial government support. The establishment of federal centers of science, education and high technologies in Siberia has already started in Tomsk and Novosibirsk. Novosibirsk State University (NSU) together with the Siberian Branch of the Russian Academy of Sciences (SB RAS) cooperates in the development of innovation initiatives and improvement of NSU position so as to be in the academic and educational mainstream within the near-term perspective.

The paper studies the first steps in education system reforms in Russia. It shows that the processes of integration of science and education in the Russian top universities as well as around recognized regional centers in the cities of Novosibirsk, Krasnoyarsk and Tomsk increased. By the example of Novosibirsk National Research University working in collaboration with the Siberian Branch of the Russian Academy of Sciences and Technopark «Akadempark» with the support of federal and business structures the prerequisites for the entry into the education services and high technologies world market are developed. The paper describes zones of mutual interests that are attractive for the Public Private Partnership (PPP) projects.

## INITIAL STEPS OF A REFORM OF THE RUSSIAN HIGHER EDUCATION SYSTEM

Debates concerning reforms of the education system in the Russian Federation have lasted for more than ten years. All through this period, measures have been taken to increase the value-added of the knowledge accumulated in science and education by its further application in business and society. Among these measures are the establishment of federal and national universities, as a means to foster top-level higher education, as well as research and educational parks focused on the needs of high-tech business.

The elite of Russian top-universities had been in the process of formation since 2010, when the rectors of 39 Russian universities announced the creation of the Association of leading universities, with the Rector of St.Petersburg State University as its president. One of the main objectives of this new Association is to develop national academic research and to lobby for the interests of its members in the government. The Association includes all universities with a special status: federal universities, national research universities and both Moscow State University and St. Petersburg State University, whose rectors are to be appointed by the President of the Russian Federation since 2012.

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In October 2010, Andrey Fursenko (Fursenko A., 2010), then Minister of Education and Science, supported this initiative of the rectors and commented in an interview: «Caused by historical circumstances, universities are in a worse position than institutes of the Academy and of industry-financed science. This situation should definitely be changed».

Subsequently, the Russian Ministry of Education and Science has selected for future increases in government support a number of Universities, most of them members of the above-mentioned Association of Leading Universities, according to the following categories:

– The first category is to consist of the two Russian universities with special status, assigned by the President of Russia: Lomonosov Moscow State University (MSU) and Saint-Petersburg State University (SPSU). Their stipend funds will be 40 per cent higher than the standard level.

– The second category would comprise 29 National Research Universities, which received this status on a competitive basis. Among them are Bauman Moscow State Technical University (BMSTU), Moscow State University of Civil Engineering (MGSU), National Nuclear Research University (MePhi), Novosibirsk State University (NSU) and others. Their stipend funds will be augmented by 25 per cent.

– The third category would contain nine Federal Universities – large academic education centers, among them Siberian Federal University in Krasnoyarsk, Northern Arctic Federal University and others. Their stipend funds will be augmented by 20 per cent.

By the end of 2012, when this plan had been announced by the Russian Ministry of Education and Science and a corresponding Federal Law on Education had been adopted after its second reading on October 17, 2012, this selection became a public issue, as it was based on criteria that were and still are controversial. In further debates it was demanded that the status of a leading university should be based on a transparent system of unbiased ratings of all Russian institutions of higher education and should also take into account that certain departments and chairs are often ranking higher than their institutions as a whole.

In world-wide education ratings, such as ARWU (Academic Ranking of World Universities released by the Center for World-Class Universities at Shanghai Jiao Tong University), QS (Quacquarelli Symonds) and THE (Times Higher Education World University Rankings), in which at least 20,000 universities are presently taking part, Russian universities are thinly represented. Among its 300 top-ranked universities, THE lists in 2013 there was only one Russian university – MSU (50th). In the ARWU rating for 2012, only two Russian universities were present – MSU (80th) and Saint Petersburg State University (between 400 and 500). Thus, these rankings can hardly provide a basis for a selection for increased funding among Russian universities.

A useful indicator in this regard might be the capability of a university to attract the best high school graduates, which is evident from ratings of the popularity of individual universities among the winners and runners-up of Russian Academic Olympiads. The results of all-Russian Olympiads published in the newspaper «Poisk», № 43 in 2011 show that some universities that are officially more strongly supported or more widely-known are more attractive for high-school graduates than the other ones (Table 1).

Attractiveness for foreign students might be a related indicator. Russia is still among the world's top ten exporters of educational services, even though the use of the Russian language in the world is decreasing, the Russian language now ranking 7th or 8th by the number of people who speak it.

What academic training areas do foreign students choose in Russia? The most popular ones are engineering and technical qualifications, medicine and economics, then learning the Russian language, both in preparatory courses and in conjunction with another major training. Social and humanitarian sciences complete the list of the areas of interest for foreign students. Other fields – natural and exact sciences, computer science and computer engineering, and agricultural sciences – are in low demand.

Table 1

**Rating of Preferences Shown by the Winners and Runners-up of Academic Olympiads  
When Selecting Higher Education Institutes in 2011**

Preferred list	Name of higher education institution	Number of top high-school graduates
1.	Lomonosov Moscow State University (MSU)	1961
2.	National Research University «Higher School of Economics»	927
3.	Siberian Federal University	745
4.	Saint-Petersburg State University	589
5.	Moscow Institute of Physics and Technology State University (MIPT)	414
6.	Pirogov Russian National Research Medical University	399
7.	St. Petersburg National Research University of Information Technologies, Mechanics and Optics	337
8.	National Research Nuclear University (MEPhI)	300
9.	Novosibirsk State University	244
10.	Financial University under the Government of the Russian Federation	240
11.	MGIMO University (Moscow State Institute of International Relations)	231
12.	National Research University «Moscow Power Engineering Institute»	180
13.	Novosibirsk State Technical University (NSTU)	173
14.	Moscow State Pedagogical University	164
15.	Russian State University for the Humanities	139

Nearly 40% of foreign students in Russia come from Commonwealth of Independent States (former Soviet Union republics generally with some fluency in Russian) and more than 35% from Asian countries, 6.3% from Arabic-speaking Middle East and Northern Africa countries and 6.9% from other African countries. The share of students from Western Europe in Russian universities (4.4%) is much lower and other continents and regions are represented even less (V. Kuleshov, G. Untura and A. Evseenko, 2012). All in all, 120.000 students from 165 countries are trained in full-time programs at Russian higher education institutions. The most popular universities which train from 1,000 to 5,000 foreign students are listed in Table 2.

In Siberia, Tomsk, with the Tomsk State University, National Research Tomsk Polytechnic University and some other universities, stands out as an international education center (V. Kuleshov, G. Untura and A. Evseenko, 2012). The region of Altai Krai is setting ambitious goals for itself, hoping to profit from its geographical location. European universities attract increasingly more students from Russia, but are slow to send their students to Russia.

Attractiveness for prospective students can hardly be considered as the sole indicator for the selection of a university for increased funding, however, since student numbers have recently experienced a serious inflation. Currently, 57 percent of Russian citizens at the age of 25–35 have completed higher education. Only three other countries – Japan, South Korea and Canada have achieved the same level. While Japan has set for itself the goal to give

higher education to all its citizens, it has at present 31 university students per thousand citizens, while Russia has 65. In Japan, this figure has been stable in the last twenty years, while in Russia a similar level (around 30 students per thousand citizens) was attained in the beginning of the 1990's and has about doubled since then. A similar situation is typical for most of the countries of the former Soviet Union. This can mainly be attributed to the advent of fee-based higher education, which provided financial incentives for universities to expand the number of their students (Present-day Role of Siberian Economy in the Russian Macroeconomic Complex / ed. V.V. Kuleshov. (2013).

Table 2

**Russian Higher Education Institutions Having the Highest Number of Foreign Full-time Students in 2008/2009 – 2010/2011**

Name of higher education institution	Years		
	2008/2009	2009/2010	2010/2011
Peoples' Friendship University of Russia (PFUR)	5353	5324	8221
Lomonosov Moscow State University (MSU)	5776	4187	3512
Saint-Petersburg State University (SPSU)	3751	3626	3431
Saint Petersburg State Polytechnical University (National Research University)	2402	2254	2297
I.M. Sechenov First Moscow State Medical University	2335	2123	2216
Pushkin State Russian Language Institute	3708	2349	2001
National Research Tomsk Polytechnic University	1626	1592	1794
Smolensk State Medical Academy	1227	1345	1391
Pirogov Russian National Research Medical University	1042	1187	1286
Moscow Aviation Institute (State University of Aerospace Technologies)	945	973	1277

Source: Newspaper *Poisk*, № 50, 2012

Until 2020, another 10 to 11 million young people will come to the labor market and a very high fraction (8 to 9 million) of them is expected to have a university education (Education Today, 2009). It is questionable, however, whether their education will meet the requirements of the labor market. In many cases, the students' qualifications are not sufficient for the needs of high-tech production and demanding management institutions. In other parts of the labor market, the required qualifications are below that of a college graduation. The present system of higher education does not appear to be flexible enough to adapt to such a diversification.

In our opinion however, an evaluation of the universities' current situation shows a need for further development of processes which lead toward an integration with research in institutes of Academy, rather than a contraposition. This opinion is supported also by the experience of Russian scientists, who are doing research in world-ranked universities abroad. Andrey Starinets (Starinets A., (2013), for instance, now working at the Department of Physics in the University of Oxford, states in this regard: «Mechanical, thoughtless and thus all the more forced transfer of any models into a different civilization is prone to run

into many hazards... Some elements of research engineering are certainly quite universal and can be adapted, like properly organized grant financing, open international competitions to fill temporary and permanent vacancies, prestigious national fellowships which can be won by a strong candidate from any country, research institutes ... Before adapting one method or another, one should first of all consult a wide range of experts, who know the essence of the matter firsthand».

The need for more integration is evident also from data published by Vladimir Polterovich (Polterovich V., 2013) that show a significantly higher academic productivity of those top universities, which cooperate with the Russian Academy of Sciences (RAS) (Table 3).

Table 3

### Scientific Productivity of Universities and RAS, 2011

University	Total number of publications	Number of publications co-authored with RAS	Share of publications co-authored with RAS
<b>Federal Universities:</b>			
Ural Federal University named after the first President of Russia B.N. Yeltsin	342	122	35.67
Southern Federal University	296	89	30.07
Kazan Federal University	285	80	28.07
Siberian Federal University	175	127	72.57
Far Eastern Federal University	88	64	72.73
North-Eastern Federal University in Yakutsk	22	14	63.64
Immanuel Kant Baltic Federal University	12	2	16.67
<b>National Research Universities:</b>			
Novosibirsk State University	622	581	28.07
St.Petersburg Academic University – NanoTechnology Research and Education Centre of the Russian Academy of Sciences	53	45	84.91
Moscow Institute of Physics and Technology State University (MIPT)	334	206	61.68
National Research Irkutsk State Technical University	15	8	53.33
Higher School of Economics	61	29	47.54
Perm State University	71	31	43.66
Samara State Aerospace University named after academician S.P. Korolyov	44	19	43.18
St Petersburg State Polytechnical University	235	100	42.55
Nizhny Novgorod State University named after N.I. Lobachevsky	232	91	39.22
Tomsk State University	273	100	36.63

(RAS share in Russia's scientific productivity (number of publications): 55.11%; Share of the total higher education sector: 44.1%; Cooperation with RAS namely Moscow State University – 30.2% and St. Petersburg State University – 29.04%).

Source: Polterovich V., 2013.

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A serious omission of the current education reform appears to be that it ignored not only the positive aspects of programs aimed at an integration of academic science and education, but also the urgent need to develop regional innovation systems. Institutions of higher education, especially when they are united within a zone around a top university, are the most significant intellectual resource for the development of regions and municipal units. The experience of cooperation between academic research and innovation work in some regional Siberian universities has clearly demonstrated that excellent project research and architectural and engineering results can be achieved within the framework of student graduation projects. Despite the fact that municipal and regional authorities often lack resources to support these projects, they have been vitally important for the region concerned. Many local branches of central institutions of higher education brought discredit on themselves because their activity had lacked adequate quality control for almost a decade and had come down to just issuing diplomas of higher education. In the context of a current demographic dip, the maintenance of strong regional and interregional academic and education integration systems is a strategic task of top priority, whose solution requires supplementing of existing market mechanisms with government instruments.

#### **INTEGRATION OF A NATIONAL UNIVERSITY AND THE ACADEMY OF SCIENCES: THE EXAMPLE OF NOVOSIBIRSK STATE UNIVERSITY**

The creation of the Siberian Branch of the Russian Academy of Sciences (SB RAS) in the 1960's played a key role in the development of a regional innovation system in Siberia (Untura G., 2013a). Since its beginning, this system has been based on a combination of scientific achievements with knowledge transfer into the education system. Presently, 179 main chairs (departments and schools programs) of leading Siberian institutions of higher education are integrated into SB RAS institutes. In addition, 80 research and educational centers as well as 94 other facilities, which belong to a joint research and education infrastructure, have thus been established. Approximately 6,000 senior students and 1,000 master's students are trained in these joint programs (chairs) and about 2,000 post-graduates complete their training at SB RAS institutes. At the same time, almost 2,500 highly qualified specialists which are employed by research institutes teach in the higher schools (colleges) (Present-day Role of Siberian Economy in the Russian Macroeconomic Complex / ed. V.V. Kuleshov, 2013).

In 2011, about 50 years after its foundation, Novosibirsk State University (NSU) has been granted the status of National Research University. In 2012, the newly elected Rectorate (the university board) developed a program with the challenging goal of entering the list of the world's top 100 universities. In NSU, basic education in mathematics, natural sciences, economics and management is quite competitive on a national level. It includes training, which is «customized» for the needs of specific businesses and companies, focusing on engineering-technology aspects. Over the last years, the National Research University NSU has expanded by adding two new departments – a Department of Medicine and a Department of Law. In addition, NSU went ahead in developing the following innovative structures and training programs: A Cross-Disciplinary Master Center for Engineering Training, a National Nanotechnology Network, and several other developments in the fields of functional nanomaterials and high-purity substances and of information and communication technologies (IT).

Particularly the project «Specialist training on the basis of the Centers of Education and Development in Information Technologies in the Siberian Federal District (SFD) and Far Eastern Federal District» and the participation in a project for training in the area of

supercomputer technologies and specialized software in SFD are included in a list of projects recommended by the Committee on Modernization and Technological Development of the Russian Economy for funding.

In addition, «Nuclear Medicine» is a joint work of NSU with the Federal «Academician E.N. Meshalkin Novosibirsk State Research Institute of Circulation Pathology» («Meshalkin Clinic») on training for this direction. Finally, the companies Unicat and Technoscan (and others), which were founded by NSU, participate in a cooperation with the Skolkovo Innovation Center near Moscow.

In our opinion, NSU can be considered as a testing ground for «cross-boundary internationalization» of higher education in the Russian Federation. NSU has a chance to transform itself into a university that is able to meet the challenge of training skilled professionals at the world level in the context of a knowledge-based economy. This is an achievable task, given that specific experience in innovative activities have been accumulated at NSU and prerequisites for an integration between science and business have been established in the last decade. The demand for «rebranding» NSU – increasing its world ranking and the quality of professional training – had already appeared earlier, but these issues became particularly pressing by the recently proposed goal of establishing a National Center of Education, Science and High Technologies (hereinafter called CENTER).

NSU is facing several challenges in implementing these changes. While NSU holds position 3 among the top universities within Russia, one problem is a lag in upgrading NSU's international university ranking and entering a world market for educational services. Another problem is an insufficient capability to attract attention on the part of the business sector to «break-through» projects, for example in radiation medicine, laser- and space-technology projects.

With regard to specific aspects of the project of placing NSU in the Top-100 ranks, we have identified the main features of an integration of NSU and SB RAS, which have worked well in practice in recent years. To strengthen these traits, the authors proposed to outline the directions of prospective contacts between NSU, other participants of a future federal CENTER and external partners from the world's academic and education community, using the analytical tool «interaction matrix». By a matrix analysis of the relations between potential participants of such a CENTER, the prospects of stable and reliable communications can be established, which will allow the participating educational, research, business and government organizations to look for synergies from the joint use of their potentials.

We propose to use the approach «Identification of Zones of mutual interest» to detect synergy potentials and to increase the effectiveness of interactions between the participants of the CENTER (Untura G., 2013a; Untura G., 2013b). Several mutual interest zones which are widely presented in innovation practice in Novosibirsk on the initial stage of the Federal CENTER's creation. These zones are in the area of interaction between NSU and other Novosibirsk institutions of higher education and regional Academies, first of all SB RAS and the Siberian Branch of Russian Academy of Medical Sciences (SB RAMS). But this is only the beginning of searching, developing and coordinating new possibilities for the integration including the strategies of NSU development.

*Zone of interest 1:* Training of high-demand qualifications based on secondary-level (pre-college or school) and higher-education institutions, including specialized masters programs customized to the demands of specific companies.

In the following areas, integration between education and research, that takes into account mutual interests in staff training and its further employment in the framework of the CENTER can be organized on the basis of NSU, SBRAS, SBRAMS and Novosibirsk Interacademic Education Center:

- NSU's academic department, including master, postgraduate and postdoctoral student training based on SB RAS and SB RAMS institutes (top skilled specialists);

- The Engineering technological department of NSU, together with the Multidisciplinary Center and the Center of Prototyping of Academpark and Novosibirsk Interacademic Education Center (focused on doing business with transnational corporations, high-tech businesses, including information technologies, information and communication technologies services, technological structures);
- Training of specialists in medical and biology sciences, for the provision of high-tech medical services in the area of environmental management, and also combining/including the capabilities of various medical clinical bases (NSU, Medical University, SB RAS, SB RAMS, Novosibirsk Research Institute of Traumatology and Orthopedics and others);
- Training of specialists for work in the resource sector, based on the NSU Department of Geology and the Resource Center of the Institute of Economics and Industrial Engineering (SB RAS) and other SB RAS institutes;
- An International Business School focused on training of specialists for innovation business. Useful in this regard might be the experience of the above-mentioned Skolkovo, Moscow State University's «Business University» (which created positive environment for entrepreneurship in innovation and new businesses), as well as the experience of Norway in training specialists for the resource sector;
- Multilevel Training Centers, including a Management Competences Center;
- Other pilot projects, following from the long-term models of education development in the world.

*Zone of interest 2:* Cluster interactions: competition/cooperation with the Skolkovo Foundation, the Education, Research and Development Center in Tomsk, the Siberian Federal University in Krasnoyarsk and others.

Research and education «process stock» in SB RAS and NSU is formed to create seven research and education clusters:

- 1) Information Technologies (IT);
- 2) Nanomaterials;
- 3) Quantum technologies and nanoelectronics, with a silicon factory within the cluster structure;
- 4) Nanotechnologies, including genomics, molecular and cellular biology technologies;
- 5) Medical technologies;
- 6) New technologies for mineral resource exploration and extraction;
- 7) Technologies for national defense and security.

An analysis by several researchers from the Institute of Economics of more than 25 cross-disciplinary projects in the field of physical and technical sciences shows especially that sufficient research «process stock» has been formed for the development of innovation clusters, that will help to advance technological areas of high priority in the Russian Federation.

In 2012 applications for the following five territorial innovation clusters have been prepared and submitted to the Russian Federal Ministry of Economic Development and Trade with the participation of the regional Administration of Novosibirsk:

- 1) A biopharmaceutical cluster;
- 2) Modern ceramic materials and nanotechnologies;
- 3) Independent energy sources;
- 4) A territorial cluster in the area of Information and communication technologies of the Novosibirsk region;
- 5) Power electronics and electrical engineering.



Two of these applicants have been identified for further support by the federal selection process – the biopharmaceutical cluster and the territorial information and communication technologies cluster. Nevertheless, NSU and other institutions of higher education and research institutes from Novosibirsk region will keep working on all the above-mentioned clusters on a priority basis with further support of the regional Administration.

*Zone of interest 3:* The development of joint small enterprises together with NSU or other research institutes according to Federal Law 217 and 218. Another increasing role of institutions of higher education is the implementation of contracts for large businesses in the form of «public-private partnership». For example, several Siberian institutions of higher education had implemented large amounts of research and staff training services for the open joint stock company «NEVZ» (Novosibirsk Electrovacuum Plant), that has launched the production of nanoceramics with the support of RusNano Company.

### **ENTRY OF NOVOSIBIRSK STATE UNIVERSITY INTO THE WORLD ACADEMIC MARKET**

Gaining the economic benefit from knowledge and skills is one of dominant characteristics of a knowledge economy. New terms of globalization call for new organizational forms, coupled with the understanding of nature of knowledge and skills set (competencies) as strategic assets. Nature of knowledge and the ways in which the knowledge can be bought and sold, are of key importance for the strategic aspects of management of knowledge and competencies (Teece D.J., 1998).

University brand becomes a market indicator of the quality of education and, therefore, the competition between universities in the world educational environment increases. We try to cite data describing the present place of NSU in several well-known world rankings.

According to the Quacquarelli Symonds (QS) TOP-400 World University Ranking, Novosibirsk State University (NSU) ranked 352nd in 2013 (up from 371st in 2012). At the same time, the University ranks 211th in terms of natural sciences which is mainly attributable to different contributions of the University departments in the ranking's results.

Obviously, the University government is aware of the difficulties of a breakthrough to the objective in view – rising to the TOP 100 group from the current TOP-400. Three foreign universities (VU University Amsterdam, Netherlands; Sungkyunkwan University National, South Korea; Tsing Hua University, Taiwan) succeeded in making it to TOP-200 from TOP-400 in five years (2007–2012), mainly by virtue of increasing their reputation in the academic environment and the number of citations of the faculty publications.

The TOP-100 goal is challenging, as the current position of NSU looks quite impressive against the background of some groups of countries. In Quacquarelli Symonds (QS) World University Rankings NSU ranks 22nd among BRICS countries (Brazil, Russia, India, China and South Africa). After the leaders – Chinese universities, Lomonosov Moscow State University and Saint Petersburg State University – comes NSU. Even Bauman Moscow State Technical University (33th position), the National Research University «Higher School of Economics» (50th position) come in after NSU. In 2013, NSU was also on 6th position in an Interfax rating among the universities of CIS, Baltic countries and Georgia.

Nevertheless the goal – making it to the TOP-100 – has been set. The move towards this objective should rest on «hyper efforts» and tailor-made approaches. The more so, since the needed resources are quite restricted by the federal budget and since a new institutional environment has appeared. A condition required to participate in the federal program for increasing the competitive ability of the top Russian universities is self-sustainability and an appointive rector.

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In July 2013, NSU became one of the 15 Russian universities, out of 36 participants, that have won the competition for the right to get a subsidy that will advance the university in the world university rankings.

It is interesting to observe the behavior of the NSU financial plan. In 2012 the University asked from the federal budget 24 billion rubles to make the first hundred of the world's top universities by 2020. In July 2013, the amount requested decreased to 14 billion rubles and, finally, in October 2013 it fell down to 12 billion rubles from the federal budget and 6.5 billion of proprietary funds. In this context, both research and total resources integration is prospective and even imperative.

The idea of a consolidation of NSU and Medical Academy looks promising and appealing according to the Rector of NSU, Mikhail Fedoruk, as this could improve the position in the world ratings dramatically. However it is impossible to predict whether this can happen and if yes, which way will be preferable. In addition, there are two competing concepts for further development of NSU. The first is to attach the academic institutes of the Siberian Branch of the Russian Academy of Sciences (SB RAS) to the University and the other is, vice versa, to make NSU report to the SB RAS (to establish an «Academy university»).

In October 2013 the meeting of the Council on increasing the competitive ability of the top Russian universities among the primary academic educational centers was held in Moscow where selected 15 Russian universities presented and defended their «road maps» showing how they were going to spend the money of the federal subsidy. The Ministry of Education, Dmitriy Livanov, chaired the Council and among the experts were Edward F. Crawley, President of the Skolkovo Institute of Science and Technology, Valeriy Kozlov, Vice-President of the Russian Academy of Sciences, Lap-Chee Tsui, Vice-Chancellor of The University of Hong Kong and others.

NSU was among the 12 universities whose road maps were approved. In the process of the realization of its «road map», NSU can use a lot of interesting suggestions made by NSU graduates including the expatriate community of graduates who are familiar with various systems of higher education in other countries.

In the beginning of September 2013, NSU conducted the NSU Alumni Congress. Its principal goal was stated as «expanding the international community of graduates wishing to make the University one of the world leaders». In contrast to most graduates living and working abroad, who proposed serious transformations of NSU's image and education structures, the graduates living in Novosibirsk and Russia – insisted on keeping the current configuration of the university, with several system changes. Both groups of graduates agreed that NSU needs to become more international. That implies the necessity to organize joint educational programs with foreign universities, to enlist foreign professors for teaching the students, to cooperate with well-known academic periodicals and research centers and to develop an international academic mobility of the students and university teachers. Surely, NSU should be more efficiently present in the media space, develop online courses and change the philosophy of online teaching in general.

An important problem is that, as the Congress showed, very few graduates plan to come back to the University either as university teachers or as participants of NSU development projects. Evgeniy Pechkovsky, president of the Association of NSU graduates, which was established at the concluding meeting of the Congress of NSU graduates, said: «I understand the large scale of the purpose of the new Association. We should do everything so that the graduates can feel at ease at the University and come back knowing that they are welcome and that their help will be accepted» (Pechkovsky E., 2013). Another serious problem is collaboration of all university departments aimed at developing and promoting NSU. Alexander Apolonsky (Apolonsky A., 2013), graduate of the Physics Department, stressed that «... without the coherent movement of all university departments we cannot succeed in developing NSU. The university work of the all departments needs to be synchronized».

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The Rector of NSU, Mikhail Fedoruk (Fedoruk M., 2013a; Fedoruk M., 2013b), outlined several aspects of the general problem of the breakthrough to the top-100 and noted that the key indicators should be changed at the cost of quality shifts which will happen in the University, in addition the system of management must be transformed and it should become similar to the management system of TOP-100 world universities. Analyzing the growth-promoting factors, he stressed that the University's reputation in the academic environment and better positions in the quoting of the university staff publications cannot take the University higher than to the TOP-200. Further growth is possible only by means of a dramatic increase in research activities (NSU website, 2013).

The University plans to use the first financial tranche of the TOP-100 campaign in the following manner:

first, on the growth of the number of citations of university staff publications by developing double affiliation with SB RAS institutes;

second, on the reform of the university management system;

third, on the creation of a marketing service of the university;

fourth, on the development of joint laboratories in cooperation with the SB RAS;

fifth, on the establishment of «mirror laboratories» (up to eleven by 2020) that are the look-a-likes of foreign laboratories, dealing with subject matters tested by the world academic community to be tested under the supervision of foreign researchers including expatriate researchers and former NSU graduates.

Prospective research activities of the joint laboratories, to be developed in cooperation with the SB RAS, will focus on the following areas: Biotechnologies; Photonics (optoelectronics); New materials; Nanotechnologies; Power engineering; Translational medicine; High energy physics; Forecast and exploration of mineral, Energy-efficient catalysis and Monocrystal growing for neutrino research.

In the present situation, when the future of the Russian Academy of Sciences is uncertain, it is hardly possible to develop these joint laboratories, particularly because the SB RAS institutes will be financed by FANO (Russian abbreviation for the «Federal Agency for Scientific Organizations»). Nevertheless, premises for the new laboratories are being allotted at the SB RAS research institutes, with the idea that some empty or liberated premises can be transferred to NSU in order to develop new joint laboratories. The Rector noted that, along with the problem of equipping the laboratories, it will be most important to create an appropriate infrastructure and to offer social benefits to the researchers who are ready to move to NSU.

While NSU does not intend to increase the number of students, the University has set for itself the task of increasing enrolments in Master's and PhD (postgraduate) programs. Currently NSU has about one third of Master's Degree students while at the top world universities this figure is over 50%. A project is now underway to organize a system for the conferment of the PhD degree in natural sciences and applied directions, based on the experience of Saint Petersburg State University. There is even an idea to hold a pilot thesis defence of Russian and foreign applicants for a degree from the year of 2015.

An important area is the cooperation with the Academpark (Technopark of Novosibirsk, Akademgorodok), developing joint applied and engineering programs, together with launching various programs in English language.

Finally we can arrive at some conclusions about the problems which NSU faces on its way to becoming a world-class top university. After the adoption of the NSU «road map» in October 2013, the Rector summed up the problems and bottle-necks of its realization during meetings with students and university teachers in December 2013 and January 2014. The following key issues can be outlined:

1) Novosibirsk Research Center or the institutes of SB RAS and NSU have different departmental structures. Under the conditions of reformation of the Russian Aca-

demy of Sciences and the uncertainties resulting from this process, it is difficult even to develop an idea of a successful, robust and consolidated university in cooperation with the SB RAS institutes. It is highly desirable that NRS and NSU look like a single entity to an external observer and in the future act as a joint research and educational system, authorized by appropriate legal acts (Yakovleva T., 2014).

- 2) Dual degree programs. Currently, the share of foreign students at NSU is about 6%, most of them from China; for world top universities this figure is not lower than 15%. NSU is interested in dual diploma program, but it is also interested in equal cooperation. Unfortunately this is not been achieved: for example, in 2013 about 70 students moved from NSU to foreign universities and few (if any) foreign students came to NSU.
- 3) The University lacks an efficient management system. There is a need to change the structure of the university governance and to seek the participation of almost all university teachers in the management process, which must take over parts of the administrative load and to set new projects into motion.
- 4) The Humanities departments must/should find their place in the development program. Currently, natural science departments, in contrast to the humanities departments, have good ratings and high numbers of publication citations. At present, there is a need for the foreign languages department, since NSU plans to launch various programs in English.
- 5) Creation of a database of the University graduates and graduate statistics concerning their occupational work; attraction of NSU graduates to the further development of the University.
- 6) Creation of a system for involving gifted researchers and professors, including foreign scientists, and the development of international mobility programs for students and teachers of the university.

Cooperation with medical workers/practitioners and researchers, physiologists and virologists is highly promising, since interdisciplinary collaboration, including international collaboration, is in demand. An undoubtedly promising project is the cooperation between NSU and NPO Vector, namely the continuation of the work on developing oncolytic virus strains.

Promising forms of cooperation are also joint laboratories and research conducted by NSU graduates in international groups and teams. There are interesting examples such as the initiative of French researchers to work directly with SB RAS institutes in the field of cellular interaction. Moreover, French professors will deliver lectures in NSU.

A new option for development and cooperation is a program for adjunct professors, which offers foreign professors the opportunity to teach NSU students, not only giving lectures on specific subjects but working with them on a more regular basis.

Other attractive areas are the cooperation with the leading Russian and foreign corporations, innovation centers, Skolkovo Foundation in the first place, technology development economic zones and Siberian technoparks.

## CONCLUSIONS

It can be concluded that the basic elements of the Siberian regional innovation system have already formed. They are primarily centered around academic institutes, the National Research Universities of Novosibirsk and Tomsk and the Siberian Federal University of Krasnoyarsk. Further increase in the competitive power of universities, the conversion of fundamental knowledge into specialist training and starting new products and businesses is subject to substantial government support. The establishment of federal centers of

science, education and high technologies in Siberia has already started in Tomsk and Novosibirsk. This process involves the identification of strategic interest zones and further concentration of state and private business resources within them. NSU together with SB RAS have mapped out a program for the development of innovation initiatives and for improvement of the position of NSU in the rankings of the world's best universities, so as to be in the academic and educational mainstream within a near-term perspective.

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