CHAPTER XI

Upgrading of the management system of the innovation activity processes at the technical university

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The universities play the important role in economy of knowledge of the advanced industrial countries. The modern universities are the sources of the qualified intellectual labour specialists, results of fundamental researches and innovative industrial technologies.

The research performed by David C. Mowery and Bhaven N. Sampat[210] is devoted to the analysis of modern challenges, tendencies in change of a role of universities in economic development of the countries and in functioning of National innovative systems, concepts of development of science and interaction of universities, business and state (Mode 2, Triple Helix). Having analyzed the huge number of publications, the authors ascertain: «In recognition of this fact, governments throughout the industrialized world have launched numerous initiatives since the 1970s to link universities to industrial innovation more closely. Many of these initiatives seek to spur local economic development based on university research, e.g., by creating "science parks" located nearby research university campuses, support for "business incubators" and public "seed capital" funds, and the organization of other forms of "bridging institutions" that are believed to link universities to industrial innovation. Governments have sought to increase the rate of transfer of academic research advances to industry and to facilitate the application of these research advances by domestic firms since the 1970s as part of broader efforts to improve national economic performance. In the "knowledge-based economy," according to this view, national systems of higher education can be a strategic asset, if links with industry are strengthened and the transfer of technology enhanced and accelerated. Many, if not most of these "technology-transfer" initiatives focus on the

P. O. Sukhoi State Technical University of Gomel (Republic of Belarus)

[210] Mowery D.C., Sampat B.N., *Universities in National Innovation Systems.* http://www.oxfordhandbooks.com/

codification of property rights to individual inventions, and rarely address the broader matrix of industry-university relationships that span a broad range of activities and outputs».

The matters of change of a role of universities in economy of knowledge were discussed during the German-Russian Symposium "Transfer of knowledge — the new key task of higher educational institutions. The experience and prospects in Russia and Germany" that was organized within the framework of the Russian-German year of education, science and innovations. The Symposium Press Release[2]" says that "... alongside with research and teaching activity, the transfer of knowledge becomes the third pillar of the science and, as far as its meaning for development of higher education and involving of high schools in the regional and international relationships is concerned, it becomes widely recognized and gains support at university and political-economical levels. This topic became urgent in Germany in the 90s, when the first experience with various models appears, the same is planned in Russia that is still interested in information exchange concerning this matter". The modern experience of organization of researches and knowledge transfer in leading universities of Germany and Russia was described in the reports[212] of the Symposium participants.

The research of matters on interaction and strengthening of cooperation between the science, business and state becomes a theme of many scientific conferences and seminars[213].

In the Belarusian model of forming a socially — oriented economy and strategy of sustainable development providing the realization of effective innovation policy, much attention is also paid to the development of the university science and matters of the commercialization of scientific research results.

The State Program[214] of Innovative Development on the years of 2011 - 2015 stipulates that " ... it is necessary to speed up the organization of the effective National System of Innovations, to use the given conditions for maximum integration of science, education, industries, formation of market stimulus of the increase of innovative activity of the subjects of enterprise activity and innovations market.

The basic tasks of State Innovative Policy are: - maintenance of legal regulation of stimulating the innovative development of economy of the Republic of Belarus; - increase of innovative activity efficiency; - maintenance of economic and social development by means of effective utilization of intellectual resources of the society; - promotion and development of the innovative production market; - promotion and development of innovative infrastructure; - perspective forecasting of technological development; - maintenance of state interests in the sphere of innovative

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[211] *Пресс-релиз Немецко-Российсского симпозиума. Кассель,* 24-25 апреля 2012 г.: http://www.owwz.de/symposium.html

Presentations. Deutsch - Russisches Symposium: Wissenstransfer - die neue Kernaufgabe von Hochschulen Innovationsforderung regional und international httpV/www.owwz.de/l 191 .html?&L=2

[213] For example, Konferencja naukowa "Synergia nauki i biznesu" Siedlce, 11 stycznia 2013 r. http://www.izim.uph.edu.pl/index.php/en/about-us/news/377-konferencja-naukowa-qsynergia-nauki-i-biznesuq-ll-stycznia-2013-r.html; Annual conferences, since thel996s, Triple Helix International Conference http://www.triplehelixconference.org/

[214] *Государственная программа инновационного развития Республики Беларусь на 2011 - 2015 годы* http://gknt.org.by/rus/gpir/gpir2011-2015/

activity; - formation of favorable environment for the development of scientific and technical activity and innovative business".

The National Innovative System of Belarus

The National Innovative System[215] of the Republic of Belarus represents the complex of legislative, structural and functional components that provide the development of innovative activity in Belarus.

The management of the National Innovative System of the Republic of Belarus is performed by the President of the Republic of Belarus, Council of Ministers of the Republic of Belarus, republican bodies of state management, NAS of the Republic of Belarus, other state organizations, bodies of local management and self-management in terms and according to their authorities.

The "National Innovative System - NIS" concept designates system interrelations that influence the processes of manufacture and innovation distributing in national economy. In the Review[216] the National Innovative System in a broad sense is treated as "a network of institutions of public and private (individual) sectors, whose activity and interaction provide initiation, import, updating and distribution of new technologies".

The structure of the national innovative systems includes three key components: public sector, research sector, and enterprise.

For the last ten years the regional measurement of innovative activity is being paid especial attention to by politicians and researchers[217]. Regional innovative systems are organized on the same principles, having the similar subsystems as the basement and similar character of interrelations between these subsystems.

The interaction with enterprises, science and education systems provides development and transfer of technologies. During the transfer of technologies the important role is carried out by the intermediaries - subjects of an innovative infrastructure.

According to the results of the research[218] carried out, the innovative infrastructure of Belarus is represented by more than 80 organizations rendering consulting, information and organizational support in the innovative area. The research authors note that not all target parameters of the Innovative Development Program on the formation of the innovative infrastructure are achieved.

The high concentration of the subjects of the infrastructure in Minsk and their insufficient presentation in other regions is observed. Despite of the variety of intermediary organizations, their number is still small, and the contribution in innovative activity is insignificant.

National innovative system and the system of innovation control in Belarus are constructed appreciably by a branch / departmental principle (" the vertical ap-

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[215] *National Innovation System,* http://www.gknt.org.by/opencms/opencms/en/nis/

[216] *Обзор инновационного развития Республики Беларусь* http://www.unece.org/ru/ceci/2011/ipr_r.html

[217] *There*

[218] *Обзор инновационного развития Республики Беларусь* http.7/www.unece.org/ru/ceci/20] 1 /ipr_r.html

proach "), it became a good starting point for further development. At the same time, the existing system is overloaded with institutions and programs and for this reason it is difficult to control it. Besides, the implemented "vertical" approach does not allow to develop effective horizontal connections (interdisciplinary and interdepartmental) that are extremely important for successful functioning of modern NIS.

It is necessary to develop and realize the measures on developing and strengthening the horizontal approaches to the decision of problems of innovative development by means of adding the «vertical» approaches to managing the «horizontal» ones within the scope of enterprises, branches and sectors, and developing the interrelations between the participants of innovative activity.

The establishment and upgrading of horizontal connections between the participants of innovative process, dynamics of their interaction, quality of mutual understanding will allow to develop the «horizontal» approaches in forming the NIS. To maintain the necessary dynamics it is necessary to create joint bodies, public organizations, branch unions and to decentralize the processes of making decisions systematically[219].

In the foreword to the Russian edition of his book[220] Etzkowitz «… pays attention that at the stage of social and economic development of a knowledge-based society it is necessary to avoid two extremes on a scale of innovative spectrum. The first extreme is the support of science and research as it is, the second one is focusing on filling the platforms for hi-tech companies by impressive buildings as the basic strategy of development of the innovative sector of economy. Use of the concept of a threefold spiral allows to avoid the situation, in which the regions with high ratings of the publications and indicators of patenting are not able to use to the full potential of resources directed on innovative development thus not having the possibility of realizing its potential to the utmost».

The analysis of institutional development of the innovative infrastructure has shown that, on the one hand, for last years dynamical development of the basic institutes of regional innovative system is observed. On the other hand, the amount of the working subjects of regional innovative infrastructure is not enough to satisfy the needs of the potential and working innovative enterprises, not enough to implement the active methodical and explanatory activity.

In our opinion the usual practice of innovative process assistance, the amount of the subjects of innovative infrastructure, their opportunities of personnel and financial maintenance testify for the necessity of upgrading of system of support of organizations innovative activity. The potential of Belarusian innovative infrastructure can be increased by involving the technical universities, as the subjects of the infrastructure, in processes of assisting the innovative activity of organization.

The state program[221] of innovative development stipulates the further development and perfection of NIS in Belarus by means « … of forming the innovative

Уваров А. Предисловие к книге *Ицковщ Г. Тройная спираль. Университеты - предприятия - государство. Инновации в действии,* 2010.

[220] Ицковиц Г. *Тройная спираль. Университеты - предприятия - государство. Инновации в действии,* 2010.

[221] *Государственная программа инновационного развития Республики Беларусь на 2011 - 2015 годы* http://gknt.org.by/rus/gpir/gpir20H-2015/

infrastructure, all-round state support of newly-established innovatively-oriented structures, creation of conditions for merge of elements of the innovative infrastructure in both large scientific and educational centres».

The Program stipulates carrying out the support of development of the innovative infrastructure with the purpose " ... of maximal use of opportunities of the subjects of an infrastructure in creating the innovative economy, manufacturing the high-tech and science-consuming production". Mechanisms of realization: - organizational-structural development of the innovative infrastructure; - development of material and financial base; - strengthening and development of personnel potential; - organization of interaction with state bodies, non-commercial associations and international organizations.

With the purpose of activating the process of creating new and upgrading the existing subjects of the innovative infrastructure it is planned[222]:

- to create for the institutions and research establishments the opportunity of organizing the innovative infrastructure subjects of any organizational and legal form; - to promote the organization of expert-consulting organizations rendering services on the matters of the intellectual property, standardizing, certification, technological audit, and also training centres of innovative activity development, both as the independent centres, and at HIGH SCHOOLS; - to improve and to increase the innovative factor of educational sphere by means of:

- upgrading the structure and content of education, educational programs by including of the problems of innovative activity (management, marketing, finance, commercialization);
- development of research sector of a higher school within orientation on NIS problems and training the young scientists in this area;
- upgrading the forms of connection between science, education and industry, development of working objects of the innovative infrastructure within the education system and developing the new innovative structures for organizing the unique scientific and methodical mechanism for personnel training in the sphere of innovations;
- continuing the work on organizing the scientific-educational-innovative complexes on the basis of universities combining educational process and scientific researches and the advanced network of hi-tech innovative structures.

Technical university as the subject of innovative infrastructure

The P.O. Sukhoi State Technical University[223] of Gomel is one of leading technical high schools of Belarus, the University trains the engineering staff and staff of maximum scientific qualification for such branches as mechanical engineering, metallurgy, power, economy, radio electronics and information technologies.

The basic task of the University is performing the educational, intellectual, cultural and social mission directed on satisfaction of needs and interests of a person and the state.

[222] *There*

[223] *Educational establishment Pavel Sukhoi State Technical University of Gomel* http://www.gstu.by/en/universityrates

Today the training of engineering and economic staff for the economic complex of the country is performed in 21 specialties by first and 6 specialties of the second stage of higher education, 15 specialties of retraining of the staff with higher education is carried out at 30 Departments and by about 400 persons of academic staff. 144 instructors have academic degrees and ranks, including 12 doctors, professors and 132 candidates of sciences, senior lecturers. Since 1994 the Post Graduate Department has been functioning performing training in 10 specialties.

At present the University has 4 educational buildings, including the laboratory of the heavy equipment (pilot production), 3 hostels. The library of university totals more than 535 thousands volumes. The electronic catalogue of library, electronic library and other databases are accessible to the users of the local computer network of the university. The scientific journal «Vestnik GGTU». Is published. The University newspaper «Soushka» publishes the materials on the life of the University and its structural Units.

The university carries out the international activity in the field of education, research work and innovations.

Research and innovative activity of the University is carried out at 30 Departments and in 6 research laboratories by academic staff, post-graduate students, master students, students and research department employees.

Major Research Areas of the University (2011-2015):

1) power supply reliability, electronic control systems for machine units and assemblies; non-destructive methods and means of control, diagnostics, monitoring and testing;

2) physics of macro- and microscopic phenomena, nuclear physics technologies; optical technologies and systems;

3) novel ceramic, nano- and microstructured materials, modelling and creating adaptive materials; metallurgy processes, casting alloy production , structure and properties of condensed media;

4) energy efficient technologies, hydro- and gas dynamics, heat- and mass transfer in complex systems, media and substances;

5) ecology, evaluation of environmental condition; methods of complex study and efficient development of mineral wealth;

6) analysis, simulation, design and testing of machines, assemblies and units; high energy processes of material treatment and hardening and also coating formation;

7) managing social processes and sustainable development of national economy; computer technologies, information resources and services.

Annual International Scientific and Technical Conferences are held on the following subjects:

- «Present-Day Problems of Engineering Science» (Presenting papers in memory of P.O. Sukhoi);
- «The Problems of Regional Economy: Theory and Practice»;
- «Mentality of Slavs and Integration Processes: History , Modern Times, Prospects»;
- «Intercollege Conference of Students, postgraduate students for the Master's and Ph.D. Degrees»

The University is one of the organizers of International Schools of High Energy Physics the meeting of which are held in Gomel.

For perfection of activity at university the system of management of quality certificated on conformity to the requirements of the standard СТБ ISO 9001-2009 in National system of acknowledgement (confirmation) of conformity of Republic Belarus and on conformity to the requirements of the standard DIN EN ISO 9001:2008 in German system of accreditation is introduced. The certificates of quality are distributed to educational services, preparation of the science officers of maximum qualification, retraining and improvement of professional skill of the staff, research and innovative activity of university.

With the purposes of assisting the development of processes of the innovative organizations activity, strengthening of connection between the university and regional economic development, increase of quality of preparation of the engineering and economic staff within the integration of educational process and industry in 2011-2015 the assistance to development of innovative of activity of organizations at the University if performed within the project "GSTU - Consult" - assisting the innovative development of organizations. The initiator of the project is the research laboratory of quality management and of business - processes modelling.

The innovative project (the innovation type[224] - process and organizational), is directed on introduction of a new way of organization of mutual relation with organizations that are carrying out the innovative activity. At the University within the framework of the project the mechanism of assistance to the innovative process will be created.

The realization of the innovative project is a perspective direction of expansion of activity of university and solving the problems on maintenance of the subjects of managing and population with informative-consulting services in the area of innovative activity.

The competitive advantages of the project are provided: - high and versatile qualification of the academic staff and science officers of university; - presence of certified research laboratories provided with the modern equipment; - opportunity to carry out versatile target training of personnel, retraining both improvement of professional skill of the chiefs and experts of organizations realizing the innovative projects; - use of technologies of design management (Project Management); - principle «orientation to the client», supposing association of all tasks of innovative process and one responsible performer for the organizations - customers, experts and researchers of the university; - by functioning of the University Quality Management System.

For realization of the project it is represented to expedient creation of the University innovative centre «GSTU-Consult» - network structure uniting interested scientific - educational divisions of university, participating during assisting the innovative activity of the organizations. The participants of the Centre (Research Department, research laboratories, faculty), will render to the interested structural divisions (internal consumers) and organizations (external consumers) scientific - educational and informative-consulting services (table 11).

Руководство ОСЛО: рекомендации по сбору и анализу данных по инновациям , 2010.

Table 11. Kinds of services of the UIC «GSTU-Consult», rendered to the external and internal consumers

Kinds of services	the Consumers of services	
	external	internal
1. Thematic scientific researches by the orders of organizations, scientific - methodical support off innovative processes, scientific examination of the projects	+	
2. Consultation on commercial activity and management:		
- Business - designing (business - planning, development of business - models);	+	+
- Marketing researches;	+	+
- Engineering consulting;	+	
- Legal consultation	+	+
3. Technologies Transfer and informative-patent services	+	+
4. Service in the field of business - education:		
- Retraining and improvement of professional skills of the supervisors and experts;	+	
- Target preparation of the engineering-economic staff and assistance in employing the graduates of university;	+	
- Training in innovative business sphere	+	+
5. Assistance in Introduction of results of scientific and technical activity	+	+
6. Publishing services	+	+
7. Assistance in the development of new technologies, manufacturing of pilot samples and sets of new production	+	+

Source: own development

Success of the project, achievement of object in views and integrated approach of consulting services can be supplied under condition of organization of joint activity of the employees of scientific divisions of university. For coordination of joint activity it is offered within the framework of the given project to generate project office[225] (office of management of the projects), which will carry out the following functions: - support and realization of joint design activity at the expense of introduction of unique methodology, standards, procedures and patterns; - consulting support of the project supervisors; - support of processes of multi-design planning and coordination of the projects; - preparation of the analytical reporting for the University administration.

Conclusion

The upgrading off the system of innovative activity control within the regional technical university by means of organizing the University Innovative centre (the subject of innovative infrastructure) will allow to realize completely the modern University Mission that concerns the training of professional and qualified staff, research work, knowledge transfer and assisting the economic development of the region and to increase the efficiency of research and innovative activity.

" ' Кузнецов П. А., Кузнецов П. А., *Проектный офис как ключевое звено управления инновациями в университете,* 2010.

The project realization will influence the institutional development and increase the regional innovative system potential by means of forming the effective mechanism of innovative processes assistance, forming the new way of cooperation with organizations and institutions, supporting the development of the innovative infrastructure of the country, increasing the efficiency of client organizations' activity, increasing the efficiency of international cooperation within scientific, technical and innovative activity.