

University Innovation Ecosystem as a Mechanism of Innovation Process Development

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Abstract: In the context of modernization of Russian economy, the universities should become the major factor of knowledge intensive society, the basis of which constitutes not only highly qualified staff but also production of knowledge and its commercialization. Realization of the assigned task depends in many respects on efficiency of the process of commercialization of Intellectual Activity Results (IAR) which is reached in many respects thanks to the development of innovation ecosystem of a higher educational institution. The solution of the problems of commercialization of university researches and development depends on effective functioning of innovative ecosystem of the university contributing to the transformation of scientific researches and development into a market product. This research work is devoted to the analysis of the problems of functioning of innovative ecosystem of the university. The objective of this research is a justification of innovation ecosystem significance and identification of its prospects in the development of commercialization of intellectual activity results in a higher educational institution. According to the researchers, the prospects of development of innovative ecosystem of the university are considered in strategic development and interaction of its three basic components (constituents) which are carrying out stimulation of scientific researches, provision of their commercialization and formation of partnership organizational culture in total with necessary competences of innovative business. The formation of these competences must be secured as a compulsory component in the educational program of higher professional education for engineering specialties as well as through regular advanced professional training of employees and administrators of the elements of the innovation infrastructure of the university. The interaction of the three functional constituents of the infrastructure of university innovation ecosystem should contribute to the reduction of barriers on the way of commercialization of innovations connected with discontinuity of communications between agents, lack of marketing research, ill-developed partnership organizational culture.

Key words: Innovation ecosystem, intellectual activity results, ecosystem, development, culture

INTRODUCTION

Ecosystem approach to the research of innovation process has found its reflection in the works by Jackson (2013), Mercan and Goktas (2011) and Smorodinskaya (2014). Despite considerable attention to this problem, many questions still remain unresolved, it concerns primarily the problem of process ensuring of RIA commercialization in higher educational institutions. Foreign experience has shown the importance of overcoming barriers on the way of innovations

commercialization by means of the mechanisms of support and stimulation which are contained in innovation ecosystem of a higher educational institution.

The objective of this research consists in research of the essence of university innovation ecosystem and identification of its development prospects in the realization of innovation process. The hypothesis of the research consists in the fact that efficiency of commercialization of intellectual activity results in a higher educational institution depends on the

development of its innovation ecosystem in the basis of which should lie the principles of reasonability, interrelations between its agents, interrelations with the environment and provision of partnership organizational culture.

MATERIALS AND METHODS

The research is based on the use of the methods of systemic analysis which help determine the essential characteristics of the innovation infrastructure tools influencing on commercialization of research activity results in a changing economic environment. This study also introduces the consolidation of evolutionary economics (Osipov *et al.*, 2014) and institutional theory Jackson (2013), Makarov and Ugnich (2015) principles which claim that the institutions with the most favorable properties providing the effective development of society and economy are protected and can be developed further.

The empirical base of this research includes the data of the Federal service for intellectual property, the systems of accounting and monitoring of small innovation enterprises in scientific-educational sphere of the Ministry of Education and Science of the Russian Federation and the experience of some Russian Universities in the sphere of innovation infrastructure creation for innovation commercialization.

RESULTS

One of the main causes of the low level of license market development is the lag of Russia in the development of experimental-industrial production in comparison with the countries of the developed technological market. This lag is largely connected with the fact that as a result of recent structural changes in the economy of Russia in the following chain “fundamental science-applied science-implementation of technologies” there appeared a discontinuity-in fact industry-specific research institutes ceased to exist. And at first foreign companies bring their technologies to the level of a demanded competitive product for years, successfully introducing them to their market and then, in accordance with their popularity patent them in other countries for the development of foreign markets. High indexes of IAR sales indicate the presence of a highly competitive market of intellectual property. In Russian economy the share of state-owned enterprises, science-research institutes and higher educational institutions which have signed a contract on alienation of exclusive rights to inventions,

Table 1: The activity of higher educational institutions and science-research institutes in transference of agreements (share/density in total volume of contracts, %)

Years	Share (%)
2009	8.90
2010	13.80
2011	16.25
2012	19.93
2013	17.10
2014	10.67

patents, industrial patterns within the period of 2009- 2012 had a growth tendency and then, by 2014 a recession tendency. In 2014 this index decreased by 6.43% compared with 2013 (Table 1). Compared with foreign universities, the index of transfer of the rights to the use of intellectual activity results remains quite low (Tansley, 1935).

The most widespread way of intellectual property commercialization has become creation of small innovation enterprises in the university. The aim of SIE creation is the adaptation of university research results and developments to the requirements of real sector of economy and their embodiment into new products or services with subsequent implementation on the market. Here, with the University can be its founder single-handedly as well as to involve other persons as co-founders of this enterprise. Thus, the provisions of the Federal Law No. 217 dated from 02.08.2009 which allows the universities to create SIE, have opened opportunities for the development of effective mechanisms of interaction between science-educational and productive sectors of economy. The transformation of the regulatory-legal base governing the establishment of small enterprises at universities is conditioned by entry into force in 2013 the Federal Law No. 273-FL “on education in the Russian Federation” amendments and addenda to the Civil Code of the Russian Federation, etc. One of the most significant changes is the deregulation of the university share in the authorized capital of the established enterprise. However, despite the changes in legislation, aimed at improving investment attractiveness of small enterprises and flexibility of the processes of IAR commercialization in the universities, the activity of the universities in the creation of small enterprises has noticeably declined. In 2015, there were created small enterprises by 38.8% < in 2014 and by 71% < in 2010.

Deterioration of the key indicators of IAR commercialization in universities is a reflection of the decline in their innovation potential due to the following reasons:

- Scientific research and developments of the universities are often torn off from the needs of real sector

- The activity of developers and agents of innovation university infrastructure is often only formally focused on the commercialization of innovations but actually just on the writing of reports
- The algorithm of the process of commercialization is nonexistent whereas the existing agents of innovation infrastructure are weakly interconnected
- In universities there is no effective system of motivation and stimulation of researchers in IAR commercialization
- Entrepreneurial culture is not sufficiently developed in the universities

The necessity of solution of these problems and tasks of transformation of the universities into a recognized source of technologies, human resources and knowledge forms the need to establish university innovation ecosystem for innovation commercialization. The notion of “ecosystem” was introduced into scientific circulation by English botanist A. Tansley by this term he understood any set of jointly inhabiting organisms and their environment (Ugnich *et al.*, 2015).

In other words, an ecosystem is a system of energy exchange, interrelations between its participants. The application of the concept of eco systems to solve the problems of innovation process let identify their causes as well as to model prospects. In this regard, it is expedient to study the mechanism of innovation commercialization from eco system approach standpoint. The focus of ecosystems study in relation to innovation process and community of its participants is conditioned by the development of the concept of open innovations Chesbrough (2003), Shkurkin *et al.* (2015, 2016) in the basis of which lies massive outsourcing and formation of global value chains. The concept of innovation ecosystem was proposed by Kavan (2015) (the development of innovation ecosystems of universities and research centers 2015). It offers a tool to create conditions contributing to increase in competitiveness of organizations in national and regional economies. In the heart of the concept is the idea of innovation as a process of idea transformation into a commercial product or a service which demands much collective efforts of the participants: companies, universities, research companies, venture funds and others. Innovation ecosystem unites all these efforts, thus providing an opportunity to achieve a synergistic effect.

Ecosystem approach considers as well innovation systems of different levels (national, regional, clustered, etc.) as living social organisms Smorodinskaya (2014) and Chueva *et al.* (2016) subjected to continuous change ability under the influence of new motivations of

the participants and new circumstances. The transformation of the universities into a major factor of knowledge-based society carries in itself the idea of innovations’ creation. A new mission of the universities is becoming a capitalization of knowledge Etzkowitz (2003) and Shkurkin *et al.* (2015) therefore, the main directions of their work should become transfer of the results of intellectual activity, technologies into the sector of production of goods and services as well as topical scientific and scientific-technical tasks into the sector of research and developments. To solve the assigned objectives higher educational institutions must possess the necessary components which on the one hand will form abilities, skills, experience, competencies for innovations implementation and enterprise management and on the other hand, contribute to resources formation for reproduction and constant development.

DISCUSSION

It is obvious that there is no universal model of University innovation ecosystem. Each University is unique in terms of its resources, exigencies, opportunities, motives and barriers in the field of innovations. However, regardless of these peculiarities, the purpose of functioning of innovation ecosystem of the University consists in implementation of the process of innovations commercialization which has a definite result in the form of introduction of products to the market. The functioning of the innovation ecosystem is aimed at providing consistent, continuous commercialization process converting the flow of ideas, developments and competencies of the teams into assets with their subsequent sale. At the same time the agents of the innovation infrastructure of the universities do not always possess stimuli to convert innovation ideas into commercial products. The <5% of university developments reach the stage of implementation into industry (Owen, 1980). The reason for this is that the financing of the developments of Russian universities by >90% is carried out at the expense of the state and is connected with major state projects which are focused on the stage of “startup ideas”. Thus, the developers are fully motivated to take part in early stages of project development with simultaneous absence of necessity to search for manufacturing company and implement their developments.

One of the most effective mechanisms to involve developers into the process of creation and transfer of the results of intellectual activity is considered to be financial incentives (financial stimulation). Financial stimulation of the developers (the authors of IAR) in universities is

Table 2: Innovation Infrastructure of don state technical university

Infrastructure element	Aim
Maintenance and support for scientific research	
Scientific research Management	Development of basic and applied research
Youth innovation centre	Development of scientific and technical potential, involvement of students and postgraduates in scientific research activity
South centre of engineering modernization	Organization of necessary extra testing, creation of experimental samples (prototypes), etc.
Centers for collective use	Increase in the level of scientific research and quality of education
Scientific research laboratories and centres	Implementation of scientific research work
Support and stimulation of commercialization of intellectual activity results	
Department of intellectual property	Registration and protection of intellectual activity results; legal support for transmission of developments into the real sector of economy
Business incubator	Creation of favorable conditions for emergence and development of innovation enterprises
Regional business catalyst	"Accelerator" of team training, formed on the basis of high-tech solutions (projects) for starting a business Mercan and Goktas (2011)

carried out mainly through the disposal of the exclusive right to IAR. The developers get a reward (a bonus) paid from the payments under license agreements and contracts of alienation of rights to IAR or disposal of the right to IAR. The developers receive a nonrecurring incentive fee for IAR creation after receiving a security document in favor of NRU HSE (Ugnich *et al.*, 2015). This form of material stimulation significantly increases the quantitative indicators of inventive activity of the University and is especially topical at the initial stage of development of the innovation ecosystem.

Characterization of the agents of innovation ecosystem in frastructure can be considered from the point of view of a commercialization process: from developments to asset formation and from assets to market transaction. Jackson (2013) and Yessenbekova (2015) notes that the basis of any model of the innovation infrastructure should contain two interrelated components, one of which is aimed at providing scientific research and developments and the other at supporting and stimulation of the process of commercialization of intellectual activity results. The second component of the innovation infrastructure takes into account the dynamics of complicated relationships which are formed between its participants whose functional task is to ensure the promotion of innovations, the provision of access to business acceleration services, the organization of access to financing on the part of business-angels and funds of pre-seed and seed investments. The majority of Russian universities has a sufficient number of agents of the innovation infrastructure who provide scientific research

and developments. However, the components aimed at supporting and encouraging innovations are often not suffice. So, among nearly 200 business-incubators functioning presently only 28% are created under the jurisdiction of the universities (Nelson and Winter, 1982).

As an example of a developed innovation infrastructure can be given the experience of Don State Technical University (Table 2).

At the same time, for the agents of the innovation infrastructure in addition to their quantitative diversity is no less important their functional contents. Typical problems of functioning of the innovation infrastructure of many Russian universities are the following:

- Inefficiency or absence of marketing technologies and competencies, search of commercial customers
- Inactive search of commercializable solutions on the use of IAR
- Absence of active search of copyrightable IAR

CONCLUSION

A successful innovation ecosystem of the University forms a suitable environment for commercialization itself; in particular, it can develop the necessary informal institutions such as partnership organizational culture. Partnership organizational culture corresponds to the greatest degree to a successful development of the innovation ecosystem. It contains at its core a dynamic entrepreneurial and creative origin, emphasizing development and acquisition of new opportunities, encouragement of innovation, improvisations, individual initiative and freedom.

In our opinion, in the innovation infrastructure of the University along with the components for the provision of scientific research and their commercialization, must be a third functional constituent, aimed at the formation of partnership organizational culture and the necessary competences in the field of innovation entrepreneurship, marketing of the technologies, protection of intellectual property.

Thus, the prospects of development of innovation ecosystems of the universities, contributing to successful IAR commercialization are seen in realization of the following directions:

- The formation of precise priorities of scientific and innovation activity
- The interaction consolidation between different elements of the University ecosystem
- The development of relationships with venture capital funds and investors

- The development of cooperation with enterprises of real sector of economy, including through active marketing resources of the university
- The active search of projects, teams and competences
- The development of partnership organizational culture and competences of innovation entrepreneurship

REFERENCES

- Chesbrough, H.W., 2003. The era of open innovation. MIT Sloan Manage. Rev., 44: 35-41.
- Chueva, T.I., G.M. Niyazova, A.V. Metsler, D.V. Shkurkin and G. Aznabaeva *et al.*, 2016. Approaches to the development of endowment funds in Russia as an instrument of mixed financing of the social sphere. Intl. Rev. Manage. Marketing, 6: 261-266.
- Etzkowitz, H., 2003. Innovation in innovation: The triple helix of university-industry-government relations. Social Sci. Inf., 42: 293-337.
- Jackson, D., 2013. What is an Innovation Ecosystem?. National Science Foundation, Arlington, Texas.
- Kavan, S., 2015. Ethical aspects of the work of rescuers during extraordinary events. Soci. Sci., 10: 684-690.
- Makarov, S. and E. Ugnich, 2015. Business-catalysts as drivers of regional innovation systems. Foresight Russia, 9: 56-67.
- Mercan, B. and D. Goktas, 2011. Components of innovation ecosystems: A cross-country study. Intl. Res. J. Finance Econ., 76: 102-112.
- Nelson, R.R. and S.G. Winter, 1982. An Evolutionary Theory of Economic Change. Harvard University Press, Cambridge, MA., USA., ISBN-13: 9780674041431, Pages: 437.
- Osipov, G.V., M.N. Strikhanov and F.E. Sheregi, 2014. The Interaction of Science and Industry: Sociological Analysis. SFMC, Moscow, Russian.
- Owen, D.F., 1980. What is Ecology?. Oxford University Press, Oxford, UK.
- Shkurkin, D., V. Novikov, I. Kobersy, I. Kobersy and A. Borisova, 2015. Investigation of the scope of intellectual services in the aspect of virtualization and information economy of modern Russia. Mediterr. J. Soci. Sci., 6: 217-224.
- Shkurkin, D.V., I.N. Mayatskaya, O.V. Nikonova, V.S. Novikov and I.S. Vasilyeva *et al.*, 2016. Formation and development of the integrated marketing communications in the activities of production and trade enterprises. Intl. Rev. Manage. Marketing, 6: 273-278.
- Smorodinskaya, N., 2014. Network innovation ecosystems and their role in dynamisation of economic growth. Innovations, 7: 27-33.
- Tansley, A.G., 1935. The use and abuse of vegetational concepts and terms. Ecology, 16: 284-307.
- Ugnich, E.A., A.I. Chernokozov and E.V. Velichko, 2015. Innovation ecosystem of higher educational institution as a driver of commercialization of intellectual activity results. Mediterr. J. Soci. Sci., 6: 239-245.
- Yessenbekova, U.M., 2015. Role of media culture in national historical preservation. Soci. Sci., 10: 2199-2205.