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The Mechanism of Implementing the Business Model of Open Innovation for the Involvement of Potential of a Closed City in the Innovative Development of the Region

Vladimir I. Kirko,
Galina I. Popodko and Roman D. Goloushkin*
Siberian Federal University
79 Svobodny, Krasnoyarsk, 660041 Russia [1]

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The article deals with problems involving a high scientific potential of a closed city in the innovative development of regions. It gives the rationale for the effectiveness of this engagement from different perspectives. The mechanisms for the implementation of the model of regional development based on the model of "Open Innovation" are offered.

Keywords: innovative capacity, regional innovation infrastructure.

To enhance innovation in the regions it is necessary to use the innovative potential of the closed cities, science cities and academic cities. At present, there is a task of developing a mechanism to implement the business models of open innovation of closed cities for innovative development area. This determines the relevance of the research topic.

In the given works (E.A. Fiyaksel, M.G. Nazarov, 2010, V.I. Kirko, V.D. Nadelyaev, S.V. Usoltsev, R.D. Goloushkin, 2011) the necessity and possibility of participation of the scientific capacity of the closed cities in the innovative development of the territories were shown on the example of the closed city of Sarov (Nizhnenovgorodskaya region) and Zheleznogorsk (Krasnoyarsk Territory). Large-company towns, such as the Federal State Unitary Enterprise "Mining and Chemical Plant", Public corporation "Information Satellite Systems" and FSUE Russian Federal Nuclear Center – VNIIEF have a competitive knowledge-based development, which is not used for various reasons in their own production, but can be effectively used in the civilian sector of industry .

The main reasons for limiting the "flow" of technology ,which is not used in the manufacture of defense, are:

1) the absence of the Law in Russian Federation, which is similar to the law in the United States (1986) concerning the Federal Technology Transfer (http://ictt.by/rus/Default.aspx?tabid=178). This law has implemented the technology transfer duty of scientists and

* Corresponding author E-mail address: director.nifti@mail.ru, pgi90@bk.ru, romang@mail.ru

engineers of all federal laboratories (analogues of Russian closed cities) and instructed to take into account the activities of technology transfer in the evaluation of employees. It provided for special requirements, incentives and responsibility of the federal laboratories;

2) the absence of Federal Law, which is similar to U.S. law presented by Stevenson-Wydler in1980(http://ictt.by/rus/Default.aspx?tabid=178). This law deals with innovation activities, which implemented major federal laboratories to control the use of research and Technology (Management of Technology Transfer) and required that the federal laboratories have active participation in technical cooperation;

3) the absence of Federal Law, similar to U.S. law presented by Beyya-Dole in 1980 (Http://ictt.by/rus/Default.aspx?tabid=178). That law allowed the government laboratories to issue exclusive licenses to patents;

4) the absence of the Law in Russian Federation, which is similar to the law in the United States in 1992 (E.A. Sakadynets, D.Y. Faikov 2008) on technology transfer to small businesses, which has approved a test program "Technology transfer to small businesses" (TTSB) for the Ministry of Defence, Ministry of Energy, Ministry of Health and Human Services, NASA and the National Science Foundation.

5) the absence of regulations, procedures to facilitate technology transfer (licensing), Russian defense enterprises in the civilian sector in view of all measures of mutual responsibility.

The latter has negative outcomes for the economy and the modernization of Russia's national economy as a whole, namely:

1) very limited participation in the closed economic development of regions and Russia as a whole;

2) not claimed intellectual property – patents, know-how and technology, which required lots of human and material resources;

3) in some cases – the loss of priority in the world with innovative designs *

A striking example of this situation may be the loss of priority of the USSR in the technology of explosive nanodiamonds. The technology was first developed in the Federal State Unitary Enterprise "Russian Federal Nuclear Center – All-Russian Research Institute of Technical Physics named after E.I. Zababakhin" in a closed city Snezhinsk in1963, and it was declassified only in 1985 under the influence of many research groups in that time, including those in Russia, Ukraine and the United States, which have developed similar technology for getting nanodiamonds. It is difficult to say where Russia would have been in the field of nanotechnology, if the technology had been transferred in time to the civilian sector and patented in the leading countries of the world (V.V. Danilenko, 2004).

The involvement of the scientific and innovative potential in the closed business processes of the regional economy is difficult for several reasons related to the development of innovative activity in the closed cities themselves, namely, the lack of a market mentality, the reluctance of employees to resign from the local industry, "nepotism" of a small town, narrow-mindedness in terms of investment, lack of funds for innovation, marketing and so on. (E.A. Sakadynets, D.Y. Faikov, 2008).

Therefore, one must agree with E.M. Korostishevskaya, which offers the idea of enhancing high-tech innovation on the basis of restructuring defense and development of the theory and practice of open innovation in the military sector of the country (E.M. Korostishevskaya, 2011). The authors of the given article fully agree with this idea, however nowadays there are almost no tools and incentives for companies interested in the defense industry to open its technologies and transfer them to the civilian sector.

As a radical example, we can show a real situation which faced the expedition of students and teachers of the Siberian Federal University. This expedition was organized in the framework of the grant of the Federal target program "Scientific and scientific-pedagogical personnel of innovative Russia" in 2009-2013, and grants of the Krasnoyarsk Regional Science Foundation in 2010-2011. Expeditions were organized in several towns of Dolgan-Nenets district municipality in Taymyr (village Nosok and village Karaul) and Evenk municipal district (village Surinda and village Essey). There live locally indigenous minorities of the North that are engaged in traditional occupations, such as reindeer breeding, fishing and hunting. Conducted project workshops with the residents and the village administration have identified an urgent need of people living there in modern technologies and equipment, as follows:

- Energy supply in the villages, herding, hunting and fishing brigades (the cost of electricity varies from 20 – 30 rub. / KWh);
- Modernization of the architecture of settlements and the construction of houses and mobile tents;
- Providing a sustainable mobile communications and the Internet in the towns;
- Modern clothing and footwear;
- Building and insulating materials (the cost of 1 m3 of timber, imported from the mainland, is 32 rubles.)
- Modern technologies of deep processing of local raw materials (meat, fish, wild plants, etc.)

Fig. 1 shows a few photos from the modern life of reindeer-breeders in Evenk municipal district in the village Surinda (Evenks) and fishermen – hunters in the village Nosok (Dolgan-Nenets district municipality in Taymyr).

At the Krasnoyarsk Territory, there are two closed cities – Zheleznogorsk and Zelenogorsk, which possess the highest scientific – technical potential, due to their town-enterprises such as JSC "Information Satellite Systems" named after M.F. Reshetnev "(JSC "ISS"), Federal State Unitary Enterprise "Mining and Chemical Plant" (MCP) and JSC "Electro-Chemical Plant " (JSC ECP) . They are the defense industry enterprises, which have in their assets and liabilities of the numerous scientific and technical developments that could be used to significantly improve the quality of life of indigenous peoples who are engaged in traditional economic activities and are components of the cultural heritage of Russia (the readers of this article understand that a radical example is given here). It should be noted that the peoples inhabiting the northern territories of Russia still use the technology, which was developed by their ancestors, in their traditional fields.

Due to the nature of their defense industry, it can be hardly expected that they will start adapting their products and technologies for civilian use. For example, defense companies, which have designed and manufactured the suit of an astronaut, using the latest technologies and materials, are unlikely to develop a modern tent or a suit for a reindeer-breeder.

In this case, you must agree with A.Y. Smetanov, who suggests the idea of broadcasting innovation potential defense industry through an innovative structure of the university complexes (A.Y. Smetanov, 2009). That is University here is viewed through its scientific, technological and innovative potential, not only as adaptator of defense technologies to the civilian market, but also it provides the generation of knowledge-intensive small businesses and their training.

Until now, high-tech enterprises in the closed city, which were based on technology defense, have usually formed around a core enterprises

(a) (b)

(c) (d)

Fig. 1 Photographs of the modern life of reindeer-breeders in the teams section in the village Surinda (Evenki, a-b) and the fishermen – hunters in the village Nosok (Nenets, c-d).

of defense industrial complex(E.A. Fiyaksel, M.G. Nazarov, 2010, V.I. Kirko, V.D. Nadelyaev , S.V. Usoltsev, R.D. Goloushkin, 2011). Fig. 2 and 3 show Schematic diagram of the adaptation of technology to the civilian defense industry market-based business model of open innovation offered by G.Chesbro (H. Chesbrough, 2003).

Modern universities have all the conditions for the implementation of the proposed scheme, namely, scientific and technical potential; units responsible for technology transfer; units responsible for the preservation of state and commercial secrets, industrial parks, business incubators, etc.

This scheme has significant advantages:

For the defense industry:

- Better use of technology enterprises established in the civil defense sector. Especially those technologies that are not used and will not be used in their main production;
- Additional income for the defense industry of small businesses coming from the sale of licensing agreements for the transfer of intellectual property;
- Additional income of scientists, designers and technologists defense companies, the authors of patents, know-how, etc.;
- The use of technological innovations, created as a result of adaptation of

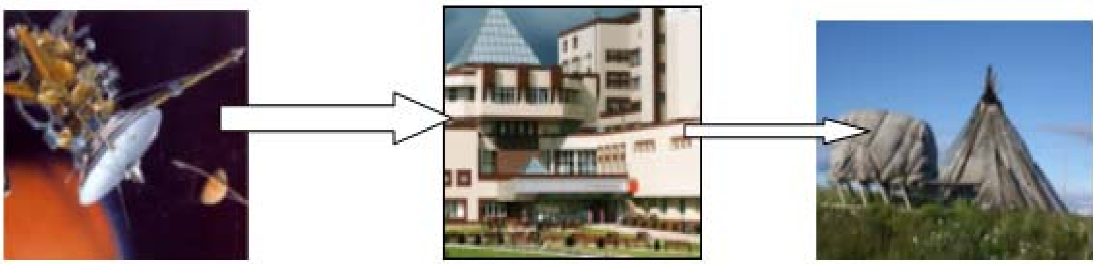

Fig. 2. A good example of adapting technology to the civilian defense industry market.

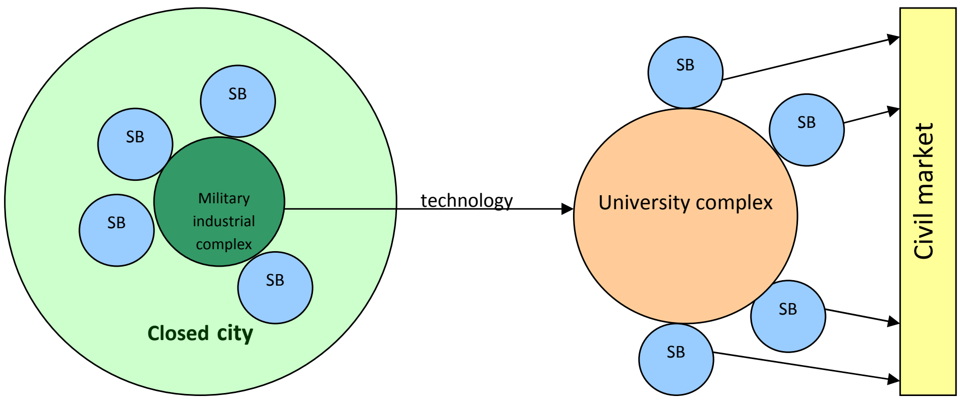

Fig. 3. Adaptation Scheme of defense technologies in the civilian market, based on the business model of open innovation G.Chesbro (SB – small businesses).

technology by scientists and technologists of the university systems and knowledge-based small businesses.

For the University:

- The possibility of greater involvement of teachers, students and graduate students in science and innovation;
- Expanding the network of small high-tech enterprises in industrial parks and business incubators;
- Preparation of teams for projects;
- Additional income of the University and its faculty from the sale of licensing agreements and investments.

The key success factors for implementation of the University of interaction with the Enterprise is the presence of military industrial complex units performing technology transfer (the University) and the unit carrying out recruitment and training of technology (in the defense industry).

From the principle of building a system on the model of the "triple helix" (Henry Itskovits, 2010), these structures are to some extent have to be integrated into each other, and their interaction must have a feedback. They bear an additional special role.

For units of the University Technology Transfer:

1) the formation, maintenance and updating of data bank on new advanced technologies related to the profile of the respective defense companies;

2) maintaining a data bank on companies that were created using the potential of defense enterprises, their technical and economic characteristics;

3) the provision of services to businesses and individuals who are owners of new technologies, establishing business contacts with defense companies as possible to the consumer of their development, as well as in the conclusion of the transaction;

4) To find investors and financing sources for specific projects, including preparation of materials needed for investment (business plans, etc.);

5) Search for University departments, enterprises and organizations capable of the further development and adaptation of the interesting developments and technologies for civil use;

6) The organization of the examination and testing of scientific and technological developments to assess the prospects of their use in the enterprise and resolve issues on the acquisition and transfer of licenses.

The unit, which carries out the recruitment and training of technology (in the defense industry), such as manufacturing and technology center, has become a gateway, which serves for the interaction of defense companies with the environment, and in our case with the universities.

Its functions should include:

1) the formation, maintenance and updating of data bank on the technologies available at the defense enterprise and ready for transfer;

2) Preparation of materials (including licensing) for technology transfer from universities or the appropriate small business under the license agreement;

3) control over the use of intellectual property and information leakage;

4) establishing a system to promote employees – the authors transferred intellectual property.

Due to the nature of production, defense companies are working behind closed doors that greatly hampers their interaction with universities. Cities in which they are located have the status of closed cities, the entrance to their territory is by a pass, and their employees sign a nondisclosure agreement. Also there is an informal closure, when people don't want to share inner information, even if it is not secret.

In recent years economists started talking more and more about the advantages of openness, saying the concept of innovation development of "open innovation". "Open Innovation" is a purposeful implementation of the various organizations of the inflow and outflow of knowledge, undertaken to improve their internal innovation activities, as well as to extend the use of innovation in the environment (V. Vanhaverbeke, 2008).

To understand what approach for a company development is the most efficient, so let's consider it as an economic microsystem in terms of its effectiveness.

On the criterion of Pareto (V.M. Galperin, S.M. Ignatiev, V.I. Morgunov, 2008), the system is effective if it is impossible to increase the welfare of at least one agent without decreasing the welfare of others. If the system is closed, then only the system itself benefits from the use of these developments. If these developments are taken and given to other agents, then this system might benefit from it by receiving income from the sale of licenses, as well as the agents which also get income. However, the criterion ceases to be satisfied when you exit out of the system implemented in the defense industry of secret projects. Thus, if you want this system to be effective according to Pareto's views, you must open it just enough to have access to confidential and unworkable technology.

Kaldor-Hicks criterion (URL: http://en.wikipedia.org/wiki/Kaldor-Hicks_efficiency) suggests that the welfare of agents can be reduced even under the condition that the agents with the increasing wealth compensate the losses. However, such an alternative to this system in military industrial complexes enterprises is not suitable because of irreversible losses associated with the leak of classified information.

According to the criterion of Rawls (V.M. Galperin, S.M. Ignatiev, V.I . Morgunov, 2008) effectiveness of the system is evaluated on the welfare of its less rich agents. If we assume that at this point the defense companies in the region are provided most with technologies, then, respectively, the remaining agents in the system are the least well off, and therefore, when they receive the necessary technology, it increases the efficiency of the system as a whole. And in this case, an open system is more efficient than a closed one.

Allocative efficiency. The system meets the allocative efficiency if it gives the most optimal combination of products with the most effective combination of resources (O.S. Sukharev, 2009).

In our case, technology, scientists, engineers, technologists, as well as finance and materials are considered to be resources. As not all defense technology projects are being implemented on the military industrial complexes enterprises, it is not necessary to talk about the optimal set of products. That means that allocative efficiency is not achieved in a closed system. Another thing, if the way of the technology will be cleared and the university will be able to find the best ways to transmit the technology to the civilian market, that's when the system is close to being allocative efficiency.

X-efficiency of H. Leibenstein (H. Leibenstein, 1995). If actual costs are higher than the lowest possible system, then this system has X-inefficiency. The costs of defense enterprises can be reduced by improving the management or partially offset by work in a partially open innovation.

How one should implement the transition to innovative development approach from closed to open innovation? E.A. Fiyaksel and M.G. Nazarov propose to adopt the Law of the Russian Federation that is similar to the law in the United States in 1986 on federal technology transfer. This law implemented a technology transfer in the duty of scientists and engineers of all federal laboratories (Russian counterparts of closed city) and instructed to take into account the activities of technology transfer in the evaluation of employees (E.A. Fiyaksel, M.G. Nazarov, 2010).

Even in the case of adoption of this law, the creation of specialized units for technology transfer (in the defense industry and the University) and establishment of a formal connection between them, the process of technology transfer will actually not work.

More preliminary work need to be done: to determine the appropriate goals and objectives, key activities and tools, performance measures and monitoring criteria and procedures for project selection (R.A. Kokorev, 2008). The fact of the matter is that the most effective control is exercised on the basis of informal institutions (R.M. Nizhegorodtsev, 2008). The latter also applies to businesses and private agents, under the influence of a complex and extensive system of formal and informal institutions. So how to establish the interaction of the university and the defense industry so that it actually carries out?

V.M. Polterovich provides three types of strategies for building institutional systems: Shock Therapy, cultivation, and the strategy of intermediate institutions (V.M. Polterovich, 2009). At the same time the third strategy has the best chance of success. Therefore it is proposed to make a transition from the development of innovative concepts from "closed innovation" to "open innovation" on the defense industry enterprises, using a strategy of intermediate institutions. To do this, one should use the

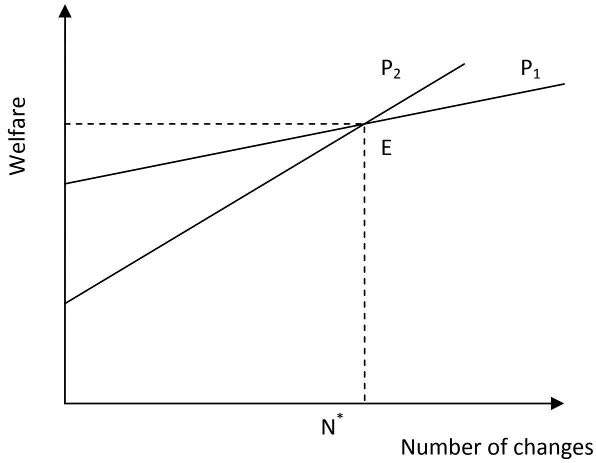

Fig. 4. A change of the welfare of agents while changing institutions.

method of interactive planning. The essence of this method lies in the gradual development and change in institutions, monitoring system status and the subsequent adjustment of the plan.

Let N be a number of changes, P1 – the welfare of defense enterprises, P2 – the well-being areas where the innovative potential of a closed city will be broadcast. Since it is assumed that the use of technology transferred will be paid royalties, the development can be represented in the graph given in Fig. 4.

Using the method of interactive planning (V.M. Polterovich, 2009), we can set up the exchange of technologies that the innovative development of the territories will eventually catch up with the development of the defense industry, and it will happen at the point E. This point is exactly a point of Pareto-efficiency of the system. And although it is given on the chart that after passing the point E the welfare of agents continues to increase, however, in practice, it is not necessary to move beyond that point, because the defense industry should always be more developed than the civil society.

Thus E is an equilibrium point of the system, and while achieving it, the setting of the institute of exchange of technologies between the defense industry enterprises and the University can be regarded completed.

The analysis shows the feasibility of the transition of enterprises to the development model based on the concept of open innovation. When implementing such a transition, it should be clarified that H. Chesbrough's option is not really suitable for this case, because it implies a reduction of R & D (research and development), which is unacceptable for our defense industry. However, from the standpoint of improving X-efficiency of the system, one should enhance the effectiveness of management in the defense industry. Therefore, speaking about the mechanism of the potential involvement of the closed businesses in innovative activities of the regional economy, the following principles must be taken into account:

1) Focus on effective management in the organization of production;

2) Build effective business model of company management based on the interaction with the environment;

3) Doing your own research and development, as well as the use of innovations which have been developed in the external environment;

4) To promote the cooperation of the experts from the leading experts in this field.

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Обоснование применения концепции открытых инноваций для вовлечения потенциала ЗАТО в инновационное развитие региона

В.И. Кирко,
Г.И. Поподько, Р.Д. Голоушкин
Сибирский федеральный университет
Россия 660041, Красноярск, пр. Свободный, 79

В статье рассматривается проблемы вовлечения высокого научного потенциала ЗАТО в инновационное развитие регионов, дано обоснование эффективности этого вовлечения с различных позиций. Предложены механизмы для реализации модели развития регионов на основе модели «Открытые инновации».

Ключевые слова: инновационный потенциал, региональная инновационная инфраструктура.