

Prospects for Technology Transfer Digitalization in Russian economy

Ustinova L., Pyataeva O. *, Borisova E.

Russian State Academy of intellectual property, Moscow 117279, Russia

*Corresponding author. Email: o.pyataeva@rgiis.ru

ABSTRACT

Innovative economic development based on technological improvement of production and promotion of new developments with high added value is the most important task of the country's development. Efficiency of the innovation process, production of high-tech products are related to the transfer of new technologies from participant to participant (developers, potential buyers, investors). Thus technology transfer is a key element of the innovation system, it contributes to transform knowledge and technology into new products and services.

The article discusses the role of technology transfer in the economic growth and development of industrial enterprises. Authors state that managing technology transfer processes in social and economic systems is becoming the most important area of innovation. Also the authors stress the prospects of digitization technology transfer processes.

Keywords: *innovation system, innovation, technology transfer, cluster infrastructure, technology transfer system, digitalization, digital technological solutions*

1. INTRODUCTION

Technology transfer is the set of economic relationships; the result of this process is transformation technology development created in one organization into a commercial product or process used by another organization. In other words, a transfer is a process of transmitting information in all available forms for a task. The promotion of knowledge about new technologies contributes to the increased implementation of state innovation programmes with regard to industrial innovation management. Effective technology transfer makes possible the formation of scientific-technological and production networks and strength the position of state in the world technology market by increasing the competitiveness of the output.

The infrastructure elements are the set of elements and interlink ages that contribute to the innovation process: the introduction of new technologies in enterprises and transforming any new product into a new market [1]. At the same time, the national innovation system plays a major role because intellectual property centres, competence centres, consulting centres determine the success of promotion of new technologies into the internal and external segments of markets, and are considered as organizational and economic forms of innovation implementation [2]. It's important that assessment and promotion of new developments based on interlink ages with individual subsystems of the national innovation system.

Necessity of elimination blank spots in technology transfer projects, development of economic efficiency indicators in innovative technologies assessment procedure, assessment

of digital transfer processes prospects requires an integrated approach to all emerging issues [3]. Assessment of technology prospects, efficiency of investments at different stages of transfer process and establishment of an optimal financing structure for the development and deployment of innovative technologies seem to be particularly relevant. Another important aspect of this issue is assessment prospects of digitization for technology transfer processes and procedures.

1.1. Related Work

According to the generation type of assumptions, we divided the existed work into three categories. On one hand we use methodological basic about technology transfer [1], [2], [4], [6], [7], [8], [12]. On other hand we based on new research in the field of digitalization in different spheres [3], [10]. The third basis was concerned with the different aspects of research in the field of innovation entrepreneurship in Russia and abroad [13], [14].

1.2. Our Contribution

This paper presents some improvements based on the methodological aspects of innovation technology transfer in Russia.

1.3. Paper Structure

The rest of the paper is organized as follows. Section 2 introduces the baseline data about currently organization of technology transfer processes. Section 3 presents a strategical model which could be a base of further research and development of innovative projects of technology transfer. Then, the projected results of the model listed in Section 4. Finally, Section 5 concludes the paper and presents direction for future research.

2. BACKGROUND

First of all it's necessary to identify how these processes are currently organized and thus to estimate potential for commercialization in order to find the most effective ways to improve the efficiency of technology transfer and the prospects for digital inclusion in transfer projects.

The authors of the article generalized the experience of different analysts in this field and based on different methodic of organizational and economic support of technology transfer, forecasting of transfer potential, methods of assessment of efficiency of projects on transfer (commercialization) of technologies [4].

The study hypothesis was formulated the following terms: technology transfer includes a number of elements related to different types of innovation. This could be the transfer of know-how through joint activities, information exchange at conferences, exhibitions, seminars, transfer of technology documentation, trade in patent-free inventions, transfer of technological information associated with acquisition or lease (leasing) of technological equipment and machines, scientific research and development in exchange of scientists and experts, organization of joint production or enterprise, etc. [5]

Technology transfer cycle includes thus the following steps: 1) technology selection; 2) technology capacity assessment; 3) technology acquisition method assessment; 4) technology acquisition options benchmarking; 5) evaluation of project performance based on investment and financial analysis; 6) decision-making.

3. CONCLUSION

The authors concluded that process of technology diffusion involving technology transfer experts, technology brokers, technology developers and users has been identified the transfer of information on innovation, technology absorption and active participation, both sources of information and recipients, focus on actors involved in technology transfer.

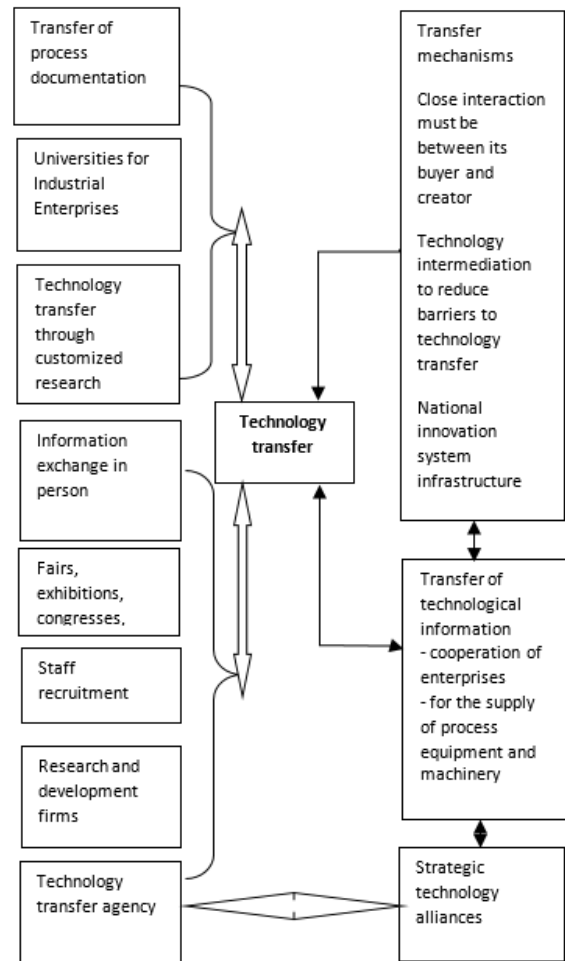


Figure 1 Structure of the technology transfer system [6]

The authors consider that technology transfer system discussed above should include the following types of enterprises:

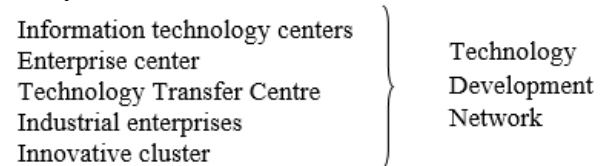


Figure 2 Institutional elements of technology transfer system forming a technology development network

Such «network» should include the entire innovation chain from the development of a fundamental scientific idea to the production and distribution of final products.

The authors propose the following technology transfer options for development and further use: a) research contracts; b) technical and analytical services; c) consulting services; d) licensing agreements; e) design services; f) formation of new high-tech companies; g) production; h) use of unique equipment by industrial enterprises.

4. DISCUSSION

The authors suggest that the following types of transfer system elements should be particularly promising [7]:

1) Technology transfer centres, which are a widespread, promising but currently inefficient form of transfer. Main task of them should be introducing innovations into high-tech industries producing strategically important products. The main functions may be: rapid provision of information, promotion of technological developments, conducting of various negotiations, development of intellectual property. The parallel development of infrastructure of national innovation system (centres helps stimulate and support technology transfer processes) is expected to enhance the positive impact on economic performance (intellectual property centres, consulting centres, etc.)

2) Innovation clusters. Economic cluster development is a business tool, as there is evidence of global demand for cluster innovation products [7], [8].

Cluster development tools include supporting development of knowledge and technology networks and transfers; facilitating the formation of specialized enterprises; and establishing retraining and retraining programmes for innovative personnel; development of branding; promotion of technological re-equipment of enterprises; development of interregional and international exchange of innovations; organization of central investment attraction and subsidies of innovative projects [5].

The experience of Moscow Cluster, which is a flexible grouping of different industries in the same geographical area to achieve common market objectives, is interesting in this regard. Due to the high concentration of scientific potential in Moscow, 43% of the Russian level of patents on inventions are registered here [6], [7]. A peculiarity of the intersectoral cluster is the diversity of competences and qualifications, the constant exchange of ideas and professional knowledge between specialists of different directions. The interaction of related enterprises, institutions engaged in different activities but capable of forming a single chain - from creative agency and the design bureau to the trading company-exporter - creates synergy effects and a pool of capabilities among the participants.

Another outcome of such clusters is increased information openness. For example, the following information can be obtained from the Moscow Innovation Cluster database:

- partners for innovative projects, including the possibility of finding a supplier, a scientific organization, an investor, a service along the process chain; use of various tools for business process automation (promotion, procurement, project activities);
- possibilities of support in cooperation with state institutions;
- financial support (grants, venture capital, etc.);
- integration with other organizations;
- the possibility of making transactions in a system of smart contracts through highly reliable blockchain technologies, etc.

3. The establishment of joint research complexes is an important tool for technology transfer, and interaction takes place with the involvement of research institutes, companies and government agencies [8], [9]. Effective commercialization of technologies requires that they be developed and implemented both outside the research center and outside the company.

In this regard, the authors consider it necessary to identify a way forward that will be decisive over the next few years in the context of the direct presence of technological solutions on the market. It is also important to ensure that they are competitive and have the potential to be implemented as a matter of priority. For example, joint research complexes can be «virtual centers» (as, for example, network organizations). Digital technology solutions [10] provide for real-time collaborative development by integrating structured and unstructured information, and by providing a constructive overview of the organization's data and data from external sources. One of the digital technology solutions in the diffusion of innovation can be a technology transfer platform [8].

The platform should accumulate data on the technological resources of intellectual property suppliers that seek to commercialize knowledge-intensive development, communicate the needs of the recipients of material knowledge interested in acquiring innovative solutions, offers expertise that can be used in the intellectual property transfer process.

The E-lucid digital platform is used extensively for intellectual property transfer by leading universities in the UK. The e-lucid platform is adapted to the needs of science and business and is designed for non-exclusive intellectual property licensing. Income from the commercialization of the results of intellectual activity and the monitoring of the effects of the implementation of innovative projects [8].

The E-lucid Digital Platform provides information about proprietary technologies available for non-exclusive licensing. The E-lucid platform provides a fast and simple way of commercializing intellectual property objects, specifying licensing conditions and acceptable royalty rate options. Built-in e-commerce features and flexibility in payment management allow both instant online purchases and traditional offline payments [8], [11], [12].

Digital technological solutions ensure the creation of digital imitations of products and production facilities that help to optimize the company's business processes. Digital technologies offer new opportunities for production companies, make them more flexible to rapidly changing market conditions, and help achieve high and stable product quality while reducing the use of resources.

The use of digital tools in the process of planning an innovative product, the design of a high-tech production provides a detailed virtual representation based on a combination of physical object-oriented modeling and data analysis [13], [14]. This reduces the number of real prototypes and, if necessary, optimizes knowledge-intensive development and processes in the early stages of implementing an innovation project.

The advantage of digital technological solutions is the possibility of simulating control systems and performing virtual commissioning of the invention, as well as the generation of machine data, which can be used for optimizing production on a permanent basis. Digital technologies ensure that all actors in the innovation process act in concert, both within and outside the company. Constant communication of actors at all stages of intellectual property transfer implementation is important to ensure maximum transparency of decision-making processes and necessary adjustments in innovation.

Thus, technology transfer based on digital technological solutions enables organizations to involve counterparties in a continuous process of data exchange, to adapt to the constantly changing business environment. Increase the ability to innovate in a digital environment.

Timely data sharing and accessible process and non-productive process analysts are key to accelerating innovation and creating competitive advantages in the real economy.

On such a platform, corporations have the ability to build value chains and create projects that can directly access all government support measures, tools to promote their products and services, and to interact with authorities, Development institutes and state corporations, tools for automation of business processes, possibilities to conclude a transaction in a system of smart contract. The platform can be accessible to all participants of the innovation market: scientific and educational organizations, industrial enterprises, IT companies, startups, venture capital funds and infrastructure facilities [5].

5. CONCLUSION

The authors propose the following principle approach to the provision of technology transfer processes in Russian economy: firstly, a provision according to which technological exchange is beneficial as a State, for the solution of strategic tasks of the national economy; and business, enabling them to increase their profitability and competitiveness in world markets of high-tech products; secondly, the thesis that should be initiate the challenges of increasing the efficiency of technology transfer enables the real sector of the economy to introduce and absorb new developments at the lowest cost and in the shortest time possible.

The authors propose the following list of measures for the development of technology transfer processes, which will eventually increase innovation activity in the Russian economy as a whole:

- managers in different branches of industry need to improve the competitiveness of their enterprises by improving technological capabilities, identifying the most promising partners and market trends in new technologies; Engineers, technicians, technologists and designers should ensure access to progressive ways of organizing their work, simplify and increase its efficiency, and realize their

potential through an innovative design solution for new technological processes;

- scientific workers are encouraged to develop existing professional competencies, to gain access to advanced technologies directly applied in enterprises, to receive material support for research projects;

- state bodies should effectively implement State programs to support industry, develop links with regions, and raise industry in the Russian Federation to a new level of technology use.

Effective joint action requires coordination between all the above-mentioned sectors of the economy and branches of government; and, at the lower levels, harmonization of detailed scientific and technological priorities for cooperation; awareness of potential participants in the cooperation about possibilities, competences; development of partner search services for organizing joint projects; network and project management skills and competencies of researchers and company employees.

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