

## Principles and practice of operation of foreign technology transfer centers \*

*The article provides a classification of intermediary organizations market innovation (technology transfer centers, business innovation centers, development agencies, etc.) on the following criteria: the founder, the organizational-legal form, market focus, the method of funding, the main directions of activities, staff, the results. The features of the system transfer technologies in the USA, Germany, Japan, Australia, China, South Africa, etc.*

*Conducted during the study analysis showed that to date there is no universal model for the functioning of technology transfer centers. However, the experience of most foreign countries is evidence of the need for major components of infrastructure for technology transfer: the legal framework governing the activities of technology transfer, financial support from both the state and the private sector, skilled and qualified personnel.*

*Initial data for the performance served as a special methodical and reference literature of domestic and foreign authors.*

*Technology transfer, the centre of technology transfer, innovations, technology transfer network, commercialization.*



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Technology transfer is a base for rapid growth and national economic expansion at the present stage of world economy development. It provides a number of strategic oppor-

tunities for business entities: the development of the domestic market, embedding of the achievements of advanced nations into the international infrastructure, etc. Technology

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transfer<sup>1</sup> involves application of knowledge and target usage of them; it is a particularly complex kind of communication because it requires the concerted action of two or more individuals or functional cells separated by structural, cultural and organizational barriers. However, the developers and owners of new technologies – the research organizations, small innovative firms, organizations of innovative infrastructure – have difficulties in finding of customers to buy their products and business partners to create enterprises. In addition, the most scientists don't have the business skills which are necessary to create business on the basis of their developments. There is also another side of this problem. If the company plans to achieve competitive advantage through improving of its technology, it is necessary to find information about technologies that could increase business efficiency.

There are many intermediary organizations of innovative market such as technology transfer centers, business innovation centers, development agencies, etc. to solve these problems worldwide. Their main function is to provide participants of innovative process with all necessary services to fulfill their potential and development of innovative abilities based on the principle of “one window”.

Thus, there are departments in the structure of most foreign universities which are responsible for relations of university with business. In some countries (the USA, Finland) technology transfer in accordance with the law has a status of the third mission of universities (in addition to educational and research activities), its nonfulfilment is punishable for university by deprivation of incorporeal rights. Nowadays many Russian universities have technology transfer departments.

Technology Transfer Center (TTC) is an infrastructure organization which produces a range of services for participants of the innovative process – the clients of the TTC.

<sup>1</sup> In translation from English a word expression “technology transfer” means: 1) diffusion process of scientific and technical knowledge; 2) practical use of scientific knowledge generated in other organization; 3) transition from basic knowledge to technology; 4) adaptation of existing technology to new use (Electronic Dictionary “ABBYY Lingvo 12”).

The Technology Transfer Centers are gathered into technology transfer nets. For example, the European network of business support includes more than 500 TTCs from different countries. The main purpose of such centers is improving of competitiveness of local industry by bringing technological innovations. The Russian Technology Transfer Network (RTTN) was established after the likeness of such structure. It is an electronic exhibition area of high-tech products. It helps buyers and sellers of high technology products to find each other. RTTN has over 70 offices in the regions. The main result of their activity is expressed not only in increasing of tax revenues to all levels of the budget, but also:

- at the enterprises level – competitive advantages and planned economic and social indicators are provided by promotion and implementation of product, technological and allocative innovations;

- at the regional level – they stimulate the achievement of planned structural changes in the economy, of GRP volume, standard and quality of life.

In foreign countries the state maintains the TTCs. For example, in the USA during the formation of technology transfer centers (this period lasts usually from 5 to 10 years) national laboratories and universities provide such centers with substantial financial support, using direct financing from its internal resources.

Subsequently, when the TTCs begin to get profit by commercialization of their researches and developments, the subsidies for the activities of the TTCs are constantly decreased, and eventually they are deceased.

In Germany<sup>2</sup> the activity of the TTCs is funded by grants of the federal government and income from contractual researches. Local authorities firstly including Land Governments also contribute greatly to the establishment of science parks and innovation centers. In addition, many organizations which are involved in

<sup>2</sup> Functions of technological moderators between laboratories and companies are carried out by various scientific societies and joint research associations in the industry. The leading organizational role belongs to “Fraunhofer Society”, whose main purpose is to implement new technologies in the industry and conduct national scale researches.

technology transfer and subsidized by the state provide additional services for a fee: training seminars, organization of the trade fairs and financial consulting.

In Japan the following scheme to create the TTC is used: as soon as it is approved, the Government provides two thirds of funds for operating expenses within the amount equivalent to 300 thousand American dollars per year for five years. In 2004 all national universities in Japan got independent legal status, so those universities could create the TTCs.

In Australia, as well as in Russia, there is no special system of government funding of technology transfer. Therefore, each university is responsible for funding their own activities in the field of technology transfer. Basic models of the TTCs created in public research organizations and universities are:

1) establishment of independent companies: the state organization provides capital to start the TTC, and the main activity is supported by the TTC's commercial activity;

2) establishment of a technology transfer subdivision in the organization: a government organization provides the direct financial support to the TTC.

In China, every major research university has the structure of technology transfer, which was originally funded by the government of the PRC from the total funds allocated to the university by

the government. However, this funding model is changing and many TTCs work as associate private companies owned only by the universities.

In 2002 in South Africa the South African Research and Innovations Management Association (SARIMA) was founded to provide stable relations between the emerging system of technology transfer and the research system. It was a leader in that process. SARIMA is funded by the government, academic institutions, as well as donors from the USA and Europe.

Thus, the analysis of technology transfer development in different countries shows that the state influenced greatly over this process, it conducts its policy through legislation on the possession, use and disposal of rights of the results of scientific and technological activities, obtained by using of the state budget.

Let's consider the work of foreign TTCs in details and classify them.

TTC's products should be attractive, at least for several customer groups. The list of Center's activities and its yield is calculated with a glance of the interests and abilities of the clients. The main client groups of the TTCs are legal persons, particularly the federal and regional authorities, local governments, large enterprises, small and medium-sized businesses, research organizations and individuals.

Any organization or individuals can be the founders of the TTC (*tab. 1*).

Table 1. TTC's Founders

Groups of founders	The main objectives	Examples
1. Research organizations (research institutes, universities)	Organization of professional activities to commercialize the results of researches and developments in the relevant research organizations	Imperial Innovations (Great Britain, <a href="http://www.imperialinnovations.co.uk/">http://www.imperialinnovations.co.uk/</a> ) Max Planck Innovation (Germany, <a href="http://www.max-planck-innovation.de/">http://www.max-planck-innovation.de/</a> ) Technology Centre of the Academy of Sciences in the Czech Republic ( <a href="http://www.tc.cz/">http://www.tc.cz/</a> ) Technology, Entrepreneurship and Commercialization Center of Cornell University (the USA, <a href="http://www.cctec.cornell.edu/">http://www.cctec.cornell.edu/</a> ) Technology Transfer Office of Emory University (the USA, <a href="http://www.ott.emory.edu/">http://www.ott.emory.edu/</a> )
2. Authorities and governments (regional and local)	Creation of a conductor (an agent) of innovative policy, promotion of the development process of technology commercialization in the region or in the area	PVA-MV (Germany, <a href="http://www.pva-mv.com/">http://www.pva-mv.com/</a> ) Austrian Agency for Researches Promotion ( <a href="http://www.ffg.at/content.php?cid=34">http://www.ffg.at/content.php?cid=34</a> ) Office of the European Union in Northern Denmark ( <a href="http://www.eu-norddanmark.dk/">http://www.eu-norddanmark.dk/</a> ) Larta Institute (the USA, <a href="http://www.larta.org/">http://www.larta.org/</a> )
3. Private companies	Business interests: for example, venture strategy of business development (opening of start-up companies, creation of interface with the research organizations), etc.	Business Information and Consulting Center (Bulgaria, <a href="http://www.bicc-sandanski.org/">http://www.bicc-sandanski.org/</a> ) Republican TTC (Belarus, <a href="http://www.icct.by/">http://www.icct.by/</a> )

The TTC can be created on the basis of any legal form, based on the specific situation and interests of shareholders. The following forms are often used:

- a structural unit (a department, a division, which isn't an independent business entity) of a research organization as a rule. For example: Imperial Innovations (Great Britain); Max Planck Innovation (Germany); Business Information and Consulting Center (Bulgaria); Office of the European Union in Northern Denmark, Technology Transfer Office of Emori University (the USA); Technology Development Office of Harvard University (the USA); Isis Innovation Ltd (England).
- a legal entity – a business entity (LLC, JSC, etc.). For example: PVA-MV (Germany);
- a legal entity – a nonprofit organization (a nonprofit partnership, a fund, an independent nonprofit organization, an association, a union). For example: Business Information and Consulting Center (Bulgaria); Agency Bruxelloise Pour L'Entreprise (Belgium);
- a consortium – a partnership (a special form of organization of economical activity without legal entity). For example, Technology Centre of the Academy of Sciences in the Czech Republic (the Czech Republic).

A regional center is prevalent among the foreign centers (*tab. 2*), i.e. there is a focusing on the scientific, technical, industrial and administrative capacity of a certain region. The regional center is usually a connecting link between the research institutions and companies in the region.

Experience of the most countries is evidence of the need for financial support for technology transfer by the government, especially in those countries where research organizations are largely state-owned.

A mixed financing of the Centre's activities is the most optimal; it includes financing by the federal programs for innovative infrastructure support, financing by the regional authorities, as well as income from the creation and maintenance of high-tech business and services. At the initial stage of creation of an innovative company the TTC is often invest it and thus gets a share in the company (usually 30%). When a financial and strategic investor appears, the TTC sells him its share.

TTC's activity usually includes consulting services in technology transfer and their commercialization or creation and maintenance of high-tech business (*tab. 3*). A combination of both activities is also possible.

Table 2. Market focus of the TTC

Measurement of market focus	Brief description	Examples
1. International Focus	Focusing on performance of research and innovation projects within the scope of the long-term joint program to accelerate the commercialization (in the domestic and foreign markets) of scientific products using the experience of the international partner	Office of the European Union in Northern Denmark Austrian Agency for Researches Promotion Larta Institute(the USA) Edinburgh Research and InnovationCenter (Great Britain) Isis Enterprise (England)
2. Regional focus	Focusing on scientific, technical, industrial and administrative capacities of a certain region. As a rule, the regional center is a connecting innovative link between the research institutions and companies in the region	PVA-MV (Germany) Imperial Innovations (Great Britain) Max Planck Innovation (Germany); Business Information and Consulting Center (Bulgaria) Technology Centre of the Academy of Sciences in the Czech Republic Agence Bruxelloise Pour L'Entreprise (Belgium) ITEK (Australia) Isis Innovation Ltd (England)
3. Thematic focus	Focusing on the definite general technology topics	Technology Transfer Office of Applied Physics Laboratory at Johns Hopkins University (the USA) Karolinska Innovation (Sweden)

Table 3. The main directions of the TTC activities

Directions of the activity	Brief description of measurement	Examples
1. Consulting service	Consulting services in the sphere of technology commercialization (technological audit, patent support, marketing support, business planning, marketing services, project management, etc.)	PVA-MV (Germany) Max Planck Innovation (Germany) Austrian Agency for Researches Promotion Business Information and Consulting Center (Bulgaria) Technology Centre of the Academy of Sciences in the Czech Republic ITEK (Australia) Isis Innovation Ltd (England)
2. Creation and maintenance of high-tech business	The purpose of this activity is to find such technology (or more technologies), which can become the basis for creating and running a business. Thus, the center actually can be regarded as a project to create a new business (sowing phase)	Imperial Innovations (Great Britain) Technology Transfer Office of Applied Physics Laboratory at Johns Hopkins University (the USA) Larta Institute (the USA) Edinburgh Research and InnovationCenter (Great Britain) Karolinska Innovation (Sweden)

Table 4. Personnel Size

Personnel Size	Examples
7 – 10 people	PVA-MV (Germany) Karolinska Innovation (Sweden)
11 – 20 people	Max Planck Innovation (Germany) Office of the European Union in Northern Denmark
21 – 40 people	Imperial Innovations (Great Britain) Isis Innovation Ltd (England) Technology Centre of the Academy of Sciences in the Czech Republic Technology, Entrepreneurship and Commercialization Center of Kornel University (the USA)
More than 200 people	Austrian Agency for Researches Promotion

As part of the center it is usually organized a clear and flexible transferring process of intellectual property rights of inventors into the business proposal selling at the market. It is reasonable to create a full innovation chain to carry out a project from concept to a small but promising company.

The average number of employees of foreign TTCs ranges from 7 to 60 people, depending on the size of the center, as well as on its core activities (*tab. 4*). It is important for the staff of the Centre to have good qualifications and experience. One or more professional specialists are employed to realize each function (service) and the most attractive conditions are created for them. It is believed that all the functions of the center should be performed at the highest level, because any error may deprive clients of sizeable profits.

The key indicators of these centers' activities are the following: a) the number of created

innovative companies (from 10 to 60 companies); b) the number of new jobs (from 215 to 2,500 seats); c) capital formation to develop innovative activity (from 1.1 to 200 million euro); d) technology transfer deals, concluded with the assistance of the TTCs (the average success rate<sup>3</sup> is about 10%) (*tab. 5*).

It should be noted that the TTCs perform many important functions such as providing the necessary information to employees in research and development spheres, to universities and companies involved in technology transfer, etc.; content and activity analysis of research agreements on the subject of commercial value and patentability of the results; advertisement of technological products; caring on negotiations about strategy and tactics of intellectual property use, etc.

As a result we can say that nowadays there is no a universal model of TTC functioning.

<sup>3</sup> In this case, "success rate" means the correlation of transactions number on the TT to the total number of technology offers and requests, prepared by the TTC.

Table 5. The Results of Work

Indicator	Value	Examples
1. Innovative companies which were created	under 10	PVA-MV (Germany)
	20 – 25	Karolinska Innovation (Sweden) Business School Chalmers (Sweden)
	50 – 65	Technology, Entrepreneurship and Commercialization Center of Kornel University (the USA) Imperial Innovations (Great Britain) Max Planck Innovation (Germany) Isis Innovation Ltd (England)
	150	Technological Factory of Karlsruhe (Germany)
2. Attracted funds, millions of euro	1,1	Larta Institute (the USA)
	45 – 50	PVA-MV (Germany) Karolinska Innovation (Sweden)
	150 – 200	Imperial Innovations (Great Britain) Max Planck Innovation (Germany)
3. New jobs which were created, number	106	Business School Chalmers (Sweden)
	216	Karolinska Innovation (Sweden)
	550	Imperial Innovations (Great Britain)
	2000 – 2500	Technological Factory of Karlsruhe (Germany) Max Planck Innovation (Germany)

However, the experience of the most countries proves that it is necessary to have the following main components of technology transfer infrastructure: legislative base regulating technology transfer activity; financial support by the government and by the private sector; skilled and qualified staff.

It is reasonable to use examined experience of foreign TTCs to develop high-tech industries in Russia. Firstly, we should organize a clear and flexible transferring process of intellectual property rights of inventors into the business proposal selling at the market. It is necessary to create a full innovation chain to carry out a project from

concept to a small but promising company. Secondly, state innovative policy and generated infrastructure should be connected by the common conception of development which can join the participants of the innovative process and stimulate technology transfer. Thirdly, universities and research institutes should be provided with the conditions when technology transfer is profitable for both scientists and industry.

All these measures allow to activate the processes of technology transfer and technology commercialization in Russia and as a result they become a basis for general economic growth in the country.

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