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THE TRANSFER OF TECHNOLOGIES IN UKRAINE: THE MAIN TRENDS*

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The main idea of this article is to show general tendencies of transfer of technologies in Ukraine, and in particular the transfer of technologies between Ukrainian actors and between Ukrainian scientific institutions and their foreign partners. There are basic data about Ukrainian scientific sphere (its structure, criteria of functioning) and its the most important results. Also the author presents top tendencies of innovation activity in Ukraine.
Keywords: transfer of technologies, innovation activity, infrastructure of innovation activity, R & D, high technologies.

General problem statement. It is well known, that the processes of transfer of technologies are a basic component of innovation activity. To begin with it's better to say more about these processes. Today any company has to implement some innovation because if it does not do it; this company has little chance to stay in the market. The reason of this situation is the tendencies of competition on the market. Now there are not many possibilities for the companies to take part in competition in the markets, but to look for some new ideas. Some time ago there were much more possibilities, like to cut staff' salaries, or to cut another type of costs. But now, because of the open frontiers, it's not so easy for companies to save the money on some kind of activity: all actors in the same part of the market buy resources with the same price. So the task for any actor on the market is where to find addition advantage over the other actors.

There are a lot of types of innovation, which can be implemented in many spheres of economic activity. There are to implement results of R & D in industry, innovation in management and business, social innovation etc. At the same time there are not many companies and institutions, which can create innovation, special infrastructure or to support scientific researches. So we have two groups of actors of innovation activity. The smaller one is the group of companies and institutions, which can create technological or another types of innovation. The bigger one is the group of companies, which have the needs of innovations, but they have not abilities to invent or to support innovation process. Processes of exchange of information between these two groups we can name «transfer of technologies». These types of process can go on between different types of actors and in different levels of interactions: inside one country, between actors in different countries, inside one huge company (between their branches, for example). The most part of researchers include in the category of transfer of technologies that those types of activity, like: transfers of know-how, personal contacts, common R & D projects, etc.

Analysis of the recent researches and publications. The theme of transfer of technologies is quite popular in Ukrainian science community. There are a lot of aspects, which are analyzed by researchers. The main actual directions of that theme are infrastructure of transfer of technologies, implementation of international experience of cooperation in scientific sphere in Ukrainian innovation policy, problems of protecting intellectual properties in Ukraine. There are lot of authors and a lot of articles about this theme, but it is better to focus on the most important of them.

Kozachenko V.Y. and Georgadi N.G. [1] researched main principals and forms of transfer of technologies in Ukraine. Also they compared Ukrainian experience with the experience of the countries, which are the members of the European Union. As the result of this analysis they proposed a few mechanisms how to intensify innovation activity in Ukraine, and especially processes of transfer of technologies between Ukrainian actors (research institutes, universities, plants, etc.).

Haustov V.K. [2] showed general directions of Ukrainian national policy in that sphere. He found reasons of the failure of this policy and obstacles, which interfere to implement the most effective levers of support the innovation process in the country. Moreover, he researched the most famous examples of realization of projects in high-tech sector, by involving of transfer of technologies.

Andronova O.F. and Cherep A.V. [3] created the conception of transfer of technologies in Ukrainian surrounding, especially how actors in scientific sphere have to interact between each other. They said, that at first it needed to create infrastructure of transfer of technologies, and then it would be possible to start real innovation activity in the country.

Unsolved parts of general problems. Despite the fact that the theme of transfer of technologies is so popular in Ukrainian scientific community, there are lots of aspects, which are still undiscovered. For example, there is lack of information about cooperation between Ukrainian actors and their foreign partners in international science space. Moreover, the situation in this sphere changes so quickly, that it needs to refresh the data about this theme every couple years.

The aim of this article is to show latest tendencies in the processes of transfer of technologies of Ukraine, especially the features of Ukrainian national policy in that sphere, cooperation between actors inside the country.

Main results of researchers. The one of the important and difficult question in the researching of this theme (transfer of technologies) is how to measure this process. Usually there are some indicators, which are used to show the structure of the transfer of technologies. For example, those indicators could be the costs of new technologies, which were transferred from universities and laboratories to innovation companies; numbers of patents, which were registered. In the context of Ukrainian reality it's necessary to consider the feature for national statistics, and consider the fact, that a lot of the processes of the transfer of technologies are passing informally, and quite often illegally.

For that case it is pertinently to use like main indicators the sum of money, which was involved by Ukrainian actors to the innovation process. These indicators of transfer of technologies includes the sum

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of booking of R & D projects by Ukrainian plants, purchase of know-how, purchase of new equipment or software, and also implementing of new technologies, which are already prepared. National statistics shows, that during the years 2005 – 2012 the sums of investments grew in Ukraine. Ten years ago this sum was minimal, and in the year 2012 Ukrainian industry spend 30 million $ to support R & D. But in the same time only 1.5% of all enterprises in Ukraine spend money to this kind of activity. Moreover, investments to patents and know-how in this period were also minimal.

But there were some positive tendencies in Ukrainian industry. Ukrainian enterprises in the same period spent huge sum to by new equipment. 10 years ago costs of this kind of activity were less than 400 million $, and in the year 2012 this sum was more than 1.2 milliard $. Basically Ukrainian enterprises buy new machines, industrial equipment and software. More than 80% of all plants do this. We can cay that it is some kind of innovation activity.

There is huge difference between some spheres of industry. Enterprises of processing manufacturing support the main part of projects in the transfer of technologies. Especially enterprises of electrical industry and information industry are the most active. Usually they support R & D projects and develop new technologies. All another enterprises implemented technologies, which are not completely new. In this occasion we can say only about modernization, but not about innovation activity. There is a tendency, that main part of enterprises (especially mining industry) does nothing in innovation sphere. In short perspective these enterprises (which do not implement innovation) haves good prospects, because they save current assets and have no additional ricks. But in long term they have no chances to stay in the market, because now the rate of change and the speed of appearance of new technologies is so great, that this enterprises will compete with the most progressive companies.

In Ukraine today there is great difference in the level of innovation activity between companies according to their size. Small enterprises buy new machines and equipment as actively as large ones do. But only large enterprises support another types of innovation activity, including transfer of technologies. In fact, in Ukraine small enterprises are out of the innovation process. This situation is not natural, because in the European countries small enterprises are much more active. Moreover, there is powerful infrastructure: it supports the cooperation between them. For example, there are lot of types of different levers and mechanisms of support innovation process: innovation networks, centers of support of transfer of technologies, relay centers, etc. But in Ukraine we can see another situation: there is not significant innovation infrastructure, and there are not little innovation enterprises (there are some exclusions, but not so many). Unfortunately, Ukrainian laws do not support innovation activity of universities and independent laboratories: Ukrainian universities have a deficit of rights, ant deficit of autonomy, so in fact they can do nothing but teach students. This is too difficult to create cooperative company between university and private individuals. Moreover this is too difficult for students to create a new innovation company in the frameworks of their university. But in other countries we can see opposite tendency: a significant part of innovation, which was implemented recently, was created by small innovation companies. A lot of these companies were flaunted by universities or students.

Another type of transfer of technologies is non-profit exchange of technologies between partners. This type of mutual relations between high-tech companies exists in many European countries. The sense of this type is to save additional money, because in this case innovation companies have common R & D projects and they share equally all costs. But on the other hand, in this case there is a need of trust between these partners, and this is the problem for Ukraine, because there is no trust between all actors in the market. It is important to say, that this type of the transfer of technologies (non-profit exchange) is not quite popular between Ukrainian enterprise, and it limits their ability.

Also there is one important thing: there is no difference between intrinsic (inside the country) and international activity of Ukrainian innovation companies. Ten of fifteen years ago the situation was absolutely different. The same companies were much more active inside the country, but not too much active in international scientific sphere. That happened because in that time there were a lot of barriers (law, for example) for Ukrainian companies to take part in international relationship. But now criteria of international activity of Ukrainian innovation enterprises look the same like their internal activity. On one hand it means, that there are no many barriers, which delay development of Ukrainian enterprise. On the other hand, all Ukrainian enterprise has the need of some types of new technologies, and they cannot find them in Ukraine.

Ukrainian innovation sphere has specifically features: local enterprises prefer to buy technologies, which were tested and implemented abroad. In other words those enterprises don't want to try to use some completely new or because of the ricks, or because local universities and laboratories have no experience to propose an after sales support. These universities (and laboratories also) have some ideas, or probably some designs. But they could not propose machines or equipment, which can be used in the manufacturing processes. In the year 2012 there were less than 700 names of new technologies, which were implemented in economy of Ukraine. Also there was lack of other kinds of transfer of technologies: recruitment of new staff with high level of education, booking of new technologies abroad, exchanging programs etc.

Industrial companies in Ukraine are more significant in innovations activity than the others. Chemical industry, food industry and engineering industry are especially the most active in the processes of transfer of technologies. But all other ways of activity do not take part in this movement, and particular in service sphere, healthcare sphere, sphere of government management. This is quite negative tendencies, because in the other countries social innovations and innovations in management are the same important as technological ones. There is a problem that all system of government management in Ukraine works as it did twenty years ago. Government organizations use possibilities of Internet just to send e-mail. Other possibilities, which were made by global web, are ignored by Ukrainian government organizations. This sphere needs innovations, particularly to implement internal experience, but here are lot of artificial barriers (outdated and weak rule of law, for example).

We can state, that the most worried tendency in Ukraine in transfer of technologies (and in innovation activity at all) is the fact, that spheres of government management and healthcare are out of hose processes.

Agriculture and food industry have been the most perspective directions of national economy during last

ten years. A lot of researches and specialists of economic development believe that these two directions will be the drivers of economic growing of Ukraine. In the period 2005-2012 Ukrainian agriculture and food industry developed quite intensively. Their indicators grow in few times. But in the same time this intensive development haven't made quality changes. Those spheres have the same structures, that they had a few years ago. There are lots of reasons of this situation, but (for our opinion) the most important is the lack of innovation activities and lack of the process of transfer of technologies between actors. The specific of Ukrainian agriculture sphere is domination of huge companies. Surely, there are lots of farmers or other private persons, which are involved to this process, but main parts of all agriculture production were made by few corporations. Unfortunately, these corporations do not support R & D projects. They only buy machines or expand their businesses: there are lots of free lands in Ukraine, so it is simpler to expand than to develop new technologies.

This analysis of the transfer of technologies will be not completed if we don't show main indicators of innovation activity in Ukraine [4].

There are 170 enterprises in Ukraine in that moment, which have possibility to create new technologies and support R & D. But in the same time there are more than 2 thousand of enterprises, which implemented new technologies and have needs in other ones. The data mean to explain some tendencies. Firstly, demand for new technologies will grow during next years, because there are lots of enterprises in Ukraine which need to modernize their industrial equipment (as they need to introduce new products). The question of modernizing of industrial equipment for them is the question of existing on the market. Secondly, the most part of all that enterprises have not their own researching departments, and in the near future they will need to buy all new technologies or from Ukrainian researching and engineering institutes, or to do it abroad.

Ukrainian institutes and another organizations, which can support scientific research, execute lots of projects, which were booked by other actors. In other words, lots of them work like contractors. The sum of that kind of contracts has grown quite well during last time. In the year 2000 the sum was 150 million $, and in the year 2011 the same indicator was 275 million $. In that year this sum (R & D orders from external customers) was 25% of all sum of money, which was spent on R & D in general. It is quite interesting, that a lot of Ukrainian scientific institutes and organizations (which can support scientific research), execute many researches projects, which were booked by foreign customers. In the year 2011 the sum of the cost of such projects was 300 million $. So we can state, that Ukrainian scientific sphere has some potential, but foreign customers need it more than Ukrainian ones.

In the year 2012 Ukrainian innovation infrastructure includes such components: 24 centers of innovations, 28 centers of education programs for entrepreneurs, 11 businesses – incubators, 23 centers of protection of intellectual propriety, 19 centers of information support, 10 innovations clusters.

As the result of this analysis of innovation sphere of Ukraine we can state, Ukrainian scientific potential is just residue of the time of Soviet Union. Unfortunately, during the period 1992 – 2014 Ukraine have not been creating new original technology, but it has saved main scientific institutions and universities.

There are a few types of technological transfer, which are the most popular in Ukraine: purchase new equipment, new production lines and R & D results. But Ukraine has specific in this question. Commercial forms of technology transfer are more popular, than form partnerships. All actors want to buy innovations and results of R & D, which are prepared to implementation. Also all actors don't want have the partners in their innovation projects. So we have the situation, when because of lack of trust between innovation enterprises there is so week situation with cooperation in innovation sphere.

Another tendency of innovation activity in Ukraine (and transfer of technologies too) appeared long time ago, just during last months. Because of deep economic crisis in the country all actors (especially actors of innovation moving) don't want to support long-term projects and too risky projects. They don't see the perspective of economy, and they don't see the future at all. Moreover, there is not forecasting: national government says nothing definitely about condition of national economy after tree or five years. But all innovations need especially this kind of support, so we can state than now innovation process in the country is stopped. There is only one possibility for developing of innovation in the country: Ukrainian national economy has too high level of power consumption. Lots of metallurgical and chemicals plants need a lot of gas and coal, many private and municipal boilers also consume natural gas. In general, Ukrainian economy spends too much amount of energetic resources, much more than others European countries. There is only one exit from this situation: modernization of main part of equipment of national industry and energetic sphere. So in that case Ukrainian enterprises have the necessity in innovation, especially in the sphere of energy saving.

In general processes of the transfer of technologies in Ukraine exist between of limited number of participants. There are couples hundreds of industrial enterprises, which are involved to these processes, and connections between them and their counterparts have existed during last fifteen years. There are not new ones between them.

There is one project, which was created specially to support this kind of processes in Ukrainian economy. We are talking about national network of the transfer of technologies, – NTTN (National technological transfer network). It has started work in the 2009. European experience was an example for the creation of this structure. NTTN has the same structure and aims, as IRC (network) had. And formally Ukrainian network has the same aims as European has. But there is difference between these two structures: Ukrainian one has not so strong support from the government, and Ukrainian companies are not as opened as European ones are. Typical Ukrainian innovation company has no wish to cooperate with another Ukrainian companies or researches institutes because of the lack of trust.

Conclusions. Based on our analysis of the situation with the transfer of technologies in Ukraine, it is possible to notice some general tendentious.

Ukrainian enterprises haven't enough resources and experience to support R & D projects. There is only 1.5% of all their quantity; which spend money that way. Most of Ukrainian enterprises don't cooperate with each other, and don't have relationship with some foreign partners.

Great problem of innovation activity in Ukraine is inability of local universities and laboratories (research institute) to support a production new ideas, new designs. Most of them prefer to support a fundamental research. There were few examples, when

Ukrainian universities of laboratories created some new design and implement it in the production. Also we can state, than Ukrainian national scientific and researching sphere are not integrated enough into international space. Moreover: during the last twenty years most of them haven't supported a serious scientific research. So now they can't propose to potential investors some actual designs.

There are a few directions of innovation activity and scientific research, where Ukrainian actors keep some positions. We are talking about several directions: chemistry, metal science and mechanics, for example. In this sphere Ukraine has significant exposure and there are some interesting designs. But Ukraine has hold this positions last twenty years, as we have said. And during this period it has created nothing new in that kind of activity.

Another characteristic of the sphere of innovation in Ukraine is the lack of innovation infrastructure, especially new components (relay center, founds of support). As we have stated earlier, the country needs that kind of institutions, because all countries, which have got success in innovations policy, have got powerful infrastructure of support of innovation activity. Moreover: Ukraine needs new type of this infrastructure in the context of integration with Europe. All members of European Union have these institutions, and if Ukraine has not got the same components, it will not can cooperate with them.

Also a huge problem for Ukraine is a very weak protection of intellectual property. Ukrainian laws in that sphere is outdated, and they do not govern all aspects of the problem. Because of that all Ukrainian companies, which create innovation, wish registrant heirs inventions and designs abroad (first in USA). But at the same moment so ineffective system blokes cooperation between Ukrainian companies because of the lack of trust.

In general we can state about processes of transfer of technologies in Ukraine that there are a few main tendentious. Formally intensive of the processes of the transfer off technologies has grown during last years, but in fact these processes exist between a few Ukrainian innovation companies and they partners. And these processes are not as intensive as Ukrainian economy needs. Also the structure of these processes is the same as ten or fifteen years ago.

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ТРАНСФЕР ТЕХНОЛОГІЙ В УКРАЇНІ: ОСНОВНІ ТЕНДЕНЦІЇ

Анотація
У статті висвітлено найбільш значимі тенденції у сфері трансферу технологій в Україні, зокрема між суб'єктами інноваційної діяльності та їх іноземними партнерами. Також у статті наведені основні дані щодо проведення наукових досліджень в Україні (їх структура, критерії оцінки) та найбільш значимі досягнення.

Ключові слова: трансфер технологій, інноваційна активність, інфраструктура інноваційної діяльності, НДР, високі технології.

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Аннотация
В статье рассматриваются наиболее значимые тенденции в сфере трансфера технологий в Украине, в частности между субъектами инновационной деятельности в и их иностранными партнерами. Также в статье приведены основные данные о проведении научных исследований в Украине (их структура, критерии оценки) и наиболее значимые достижения.

Ключевые слова: трансфер технологий, инновационная активность, инфраструктура инновационной деятельности, ГДР, высокие технологии.