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ORGANIZATIONAL AND ECONOMIC ASPECTS OF TECHNOLOGY TRANSFER IN THE WORK OF INTERNATIONAL COMPANIES

ОРГАНІЗАЦІЙНО-ЕКОНОМІЧНІ АСПЕКТИ ТРАНСФЕРУ ТЕХНОЛОГІЙ У РОБОТІ МІЖНАРОДНИХ КОМПАНІЙ

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Організаційно-економічні аспекти трансферу технологій у роботі
міжнародних компаній. Оглядова стаття.

Головна мета даного дослідження є розгляд організаційно-економічних аспектів трансферу технологій у діяльності міжнародних компаній з метою підвищення рівня їх конкурентоспроможності на міжнародних ринках. Розглянуто теоретичні положення трансферу технологій у бізнес-середовищі. Розкрито політику трансферу технологій в міжнародній роботі компаній. Проаналізовано стан ринку міжнародного трансферу технологій з зазначенням особливостей його розвитку у ринкових умовах. Досліджено регуляторні механізми трансферу технологій в міжнародних компаніях. Розкрито проблемні аспекти та перспективи впровадження трансферу технологій на національному рівні в умовах повосенного розвитку економіки України.

Ключові слова: трансфер технологій, компанії, механізм, підхід, ефективність

Taraniuk L.M., Korsakienė R., Taraniuk K.V., Siedieliev S.H.
Organizational and Economic Aspects of Technology Transfer in the Work of
International Companies. Review article.

The main goal of this study is to consider the organizational and economic aspects of technology transfer in the activities of international companies in order to increase their level of competitiveness in international markets. The theoretical provisions of technology transfer in the business environment are considered. The technology transfer policy in the international work of companies is revealed. The state of the market of international technology transfer is analyzed, indicating the features of its development in market conditions. The regulatory mechanisms of technology transfer in international companies have been studied. The problematic aspects and prospects of the implementation of technology transfer at the national level in the conditions of the post-war development of the economy of Ukraine are revealed.

Keywords: technology transfer, companies, mechanism, approach, efficiency

In today's world, where the speed of technological development, and therefore technology transfer, is increasing every year, innovation is becoming a key factor in business development. Companies that are able to quickly respond to new technologies and trends have an advantage in the competition. However, technology transfer in an international business environment is a more complex process that requires attention to various factors, such as cultural differences, legal norms and geopolitical situations.

The research of this topic is important for practitioners and managers in the field of international business, as it will help to understand the importance of technology transfer in the context of the implementation of innovative processes in international companies. In addition, the study of this topic is important for the academic world, which can use the obtained results to develop new theoretical and applied approaches to the study of technology transfer in the international business environment.

Technology transfer can be a key factor in a company's success in an international business environment, but the introduction of innovations can be a complex and risky process. For the successful implementation of innovations, it is necessary to

ensure the appropriate level of knowledge, skills and resources, as well as to take into account the peculiarities of the international business environment.

Technology transfer in the international business environment is an important element of the company's successful activity. To succeed in this area, companies must be prepared for risks and develop risk management strategies that will allow them to reduce costs and increase the chances of project success. The development of technology transfer should be a continuous process based on research, analysis and continuous improvement.

It should be added that the success of technology transfer in the work of international companies can be determined by the constant development and implementation of innovative solutions at the level of development, production and implementation of high-tech products, which contain a high share of added value, which can affect not only the economic development of the international company, but also the state as a whole.

A certain duality of this concept is present in all its more specific definitions. It can be argued that the accumulated knowledge, skills, and experience make up the essence of the concept of "technology" in the most general form.

The concept of "technology" (from the Greek techno – skill, technique and logos – science) is a set of scientific and technical knowledge about methods and methods of production, its organization and management, i.e. scientific methods of achieving practical goals [1].

From the researched scientific works, it was determined that scientists paid attention to the theoretical provisions and practical aspects of the implementation of technology transfer in the work of international companies.

Analysis of recent researches and publications

Research on the subject of international technology transfer was carried out by many domestic and foreign scientists. This is evidenced by a large list of monographs and articles in scientific journals. In particular, the exchange of technologies in the context of innovative development was studied by domestic scientists: Antonyuk L. [2] has investigated the mechanisms of commercialization of technology transfer in the work of companies; Bazhal Y. [3] researched international transfer in terms of fulfilling the goals of sustainable development; Didkivskyi M. [1] considered the social aspects of technology transfer in the work of enterprises; Mazaraki A. [4] formed the economic toolkit of technology transfer in the conditions of transition to new technological systems. The foreign school of innovative analysis also includes many names: Drucker P. [5] researched applied innovative aspects of the implementation of technology transfer in the work of international companies; Christensen C., Scott A. and Roth E. [6] developed the theoretical provisions of technology transfer; Gibson D. [7] unraveled the development of the business

environment in the conditions of innovative development of enterprises and technology transfer; Shumpeter J. [8] developed the theory of economic development regarding capital movements, technology transfer in the work of market subjects.

Unsolved aspects of the problem

The solution to the problems should be a research of the organizational and economic mechanism of technology transfer, which contains economic tools, an organizational environment that contribute to increasing the level of innovative development of international companies in a competitive business environment.

The aim of the article is to identify the implementation organizational and economic mechanisms and ways to improve technology transfer in the international company activities.

The main objectives of the study include:

- to investigate the main concepts and the role of innovative development in ensuring the competitiveness of enterprises in the international business environment;
- to form factors influencing the innovative development of enterprises in the international business environment;
- consider the theoretical provisions of technology transfer in the business environment;
- to reveal the technology transfer policy in the international work of companies;
- to analyze the state of the market of international technology transfer, indicating the features of its development in market conditions;
- study the regulatory mechanisms of technology transfer in international companies;
- to reveal the problematic aspects and the perspective of the introduction of technology transfer at the national level in the conditions of the post-war development of the economy of Ukraine.

The main part

Research methods. During the research, the following research methods were used:

- analytical method (includes the study of scientific sources, laws, theories and statistical data in order to analyze and generalize information about the process of innovative development in the international business environment);
- method of statistical analysis (to analyze statistical data related to the transfer of technologies in the international business environment, and draw conclusions about the effectiveness of the implementation of innovations in different countries and industries);
- case-study (to study the experience of implementing innovations in specific international companies and evaluate its effectiveness);
- comparative analysis (with cross-country and temporal comparison of indicators of the development of the innovation sphere);
- graphic analysis (with illustrative presentation of statistical information).

Presentation of the main research material. Innovative development and transfer of technology in the international business environment is a key factor for the success of companies in the modern world. Innovations are innovative solutions or ideas that lead to the creation of new products, services, processes or business models. They can be technological or non-technological and can change the way companies operate and interact with their customers and competitors [7].

One of the key concepts related to innovative development and transfer of technology in the international business environment is intellectual property. Intellectual property is the rights to the results of intellectual activity, such as patents, copyrights, trademarks, etc. Intellectual property is an important tool for protecting innovations and ensuring their commercialization [7].

Companies that successfully innovate have the opportunity to become market leaders and increase

their market share. Innovative development allows enterprises not only to ensure their competitiveness in the market, but also to create new markets and prospects for the development of their business. Innovative development can also help the enterprise improve its reputation and positioning in the market, which contributes to its successful development and increase in sales.

Both incremental and radical innovations affect three spheres important for competitiveness (table 1): the economy and the sectors that form it, enterprises and the business activities implemented by them, products and processes [7].

Incremental (growing) innovation means the systematic improvement of products and technologies that ensure a gradual increase in competitiveness. Radical innovations, on the other hand, create new technologies, products and business concepts that allow for a lasting competitive advantage.

Table 1. Spheres of influence of innovations

Types of innovation	Spheres of influence of innovations		
	Economy and its sectors	Enterprises, business activity	Products and processes
Growing	Business to Business (B2B) Supply Chain Integration	Organizational improvement processes (reengineering, TQM)	Modified processes and products
Radical	New, innovative structures of sectors and economy	Creation of new business concepts	Process configuration change New products

Source: compiled by authors on materials [7]

In the field of economy, the growing innovations influence the change of B2B business relationships and the improvement of the supply chain. Radical innovations create new sectors of the economy, including knowledge-based enterprises of the new economy, as well as other sectors that use biotechnology or nanotechnology, leading to structural changes in the entire economy.

Let's explore the factors influencing the technological innovation development of international companies.

One of the main factors is the technological level of the enterprise. It determines the capabilities of the enterprise in the development and implementation of new technologies, as well as in the production of high-quality products and services. Personnel qualification is also an important factor, as it affects the enterprise's ability to innovate and implement new technologies.

The external environment and competition are also important factors. Enterprises must carefully analyze changes in the external environment in order to respond to them in time and adapt to new conditions. The competitive struggle can also stimulate the innovative development of the enterprise, as it encourages companies to find new ways to improve the production and release of products and services.

Therefore, the innovative development of enterprises in the international business environment is an important component for ensuring their

competitiveness. For the successful implementation of the company's innovative strategy, it is necessary to analyze the determinants of innovative behavior of companies, identify stimulating and restraining factors, and also ensure the rational integration of all processes in the enterprise management system. However, given the increased competition and increasing requirements for product quality, companies cannot rely only on internal innovation resources and must seek external innovation resources in the form of ideas, information, knowledge and technology to develop innovation.

Along with the scientific definitions of the subject of research, its purely legal interpretation is also important. In particular, UNCTAD states that "technology" can be defined in different ways. The UNCTAD International Code on the Transfer of Technology, in its definition of "transfer of technology", describes "technology" as "systematic knowledge for the production of a product, for the application of a process or for the provision of services", which does not extend to transactions involving simple sale or simple lease [9].

Characteristic features of scientific and technological exchange are [10]:

— decisive role of science in the development of production (scientific knowledge ensures an increase in the technical level of production, at the same time, international scientific and

technological relations significantly affect all spheres of social life);

- rapid growth of the set of innovations;
- forms and rates of technological exchange development are closely related to the features of the state's economic development.

In their technology transfer activities, international companies can be guided by the following types of technology policy:

- "center-for-global" (policy of the global center) – development of new technologies in the host country to create new products using centralized resources;
- "local-for-local" (policy of polycentrism) – assumes that TNC subsidiaries use their own capabilities to develop new technologies that meet their needs;
- "globally-linked" (integrated system of technological development) – involves the unification of resources and capabilities of all elements of the TNC for the joint creation and implementation of innovations.

Today, the management of international companies is faced with a whole set of complex topics and problematic issues. Among them, we highlight the following [11]:

- What new products and services can the company develop, produce, distribute or sell?
- How does it possible provide added value to your products and services for consumers?

The features of international technology transfer at the current stage are as follows [2]:

1. The growth rate of technology trade is ahead of the growth rate of trade in other goods. The annual rate of increase in technology sales is more than 10%, while the global GDP is growing by 3-4%.

2. The main direction of technology trade is intra-firm, which accounted for about 60% of all payments 2005, and almost 90% 2015.

3. Monopolization of the technology market by TNCs, which have become the main financial donors of science and innovation. Thus, in the USA, 50 leading companies carry out almost half of R&D in industry. In small developed countries, the degree of concentration of scientific developments is even higher: in Switzerland, the three largest companies carry out 81% of national R&D, in the Netherlands four firms – about 70% of R&D. The corporations of the five most developed countries in the world account for 45 out of 50 macrotechnologies – a necessary set of knowledge and capabilities for the realization of patented products with a full production cycle on the world market. These include aircraft, reactors, ships, new construction materials, telecommunications equipment, computer programs, etc. In particular, 22 macro technologies are controlled by the USA, 10 by Germany, 7 by Japan, and 3 by Great Britain and France.

4. Internationalization of patent activity. Since, according to the estimates of the World Intellectual Property Organization, 1 out of 3/4 inventors who submitted an application under the PCT (Patent

Cooperation Treaty) procedure receives a patent, therefore applications began to be submitted simultaneously to the patent offices of several countries [12].

5. Formation of technological alliances. The number of formed European-American alliances is up to 30% of all associations, American-Japanese – 10%. Among the well-known scientific and industrial cooperations are the cooperation of companies in the field of computer technology Siemens AG (Germany) and Intel (USA), in the field of scientific instruments General Electric (USA) and Philips (Netherlands), in the field of electronics and telecommunications Toshiba (Japan) and LSILogic (USA), SGS (Italy) - Thomson (France), in the field of aircraft construction Mitsubishi (Japan) – Boeing (USA).

6. Activation of the processes of direct foreign investment in high-tech sectors of the economy. Business consolidation is dominant in this process. 2011, \$63.2 billion was spent on mergers and acquisitions in this area. USA, or 14.8% of the total costs of cross-border deals.

We will focus on three groups of global innovative companies that generate and disseminate the results of their developments in such fields as information, pharmaceutical and defense technologies. The transfer policy of the digital industry giant – Microsoft is noted for its flexibility and versatility. The company offers a wide range of licensing options – from single licenses to corporate agreements.

There are the following types of packages (more precisely, product license options):

- academic – for educational institutions;
- government – for government organizations;
- not for resale – not intended for sale;
- retail – for retail sale;
- non-specific – ordinary commercial license.

The global company Google – a division of Alphabet and recognized flagship of the digital economy – has powerful research departments. Scientific and technological activity within the framework of the "Google research" strategy covers the following areas [13]:

- philosophy – the concept of research work;
- publications – basic studies on the topic;
- people – peculiarities of working with research personnel;
- tools & downloads – proposed teaching and research tools for schoolchildren, students and scientists.

Let's consider the main features of the organization of the innovation process, technology transfer, as well as tools that contribute to high competitiveness of manufactured products and active innovative development in several countries.

Switzerland. The innovative system of Switzerland has specific features. Thus, the state is engaged in supporting fundamental research in the country, while applied research is financed mainly by the private sector. Organizations such as the State Commission for Technology and Innovation (KTI), the Swiss Association for Technology Transfer

(swiTT), the Swiss Agency for the Promotion of Innovation (l'Agence de la Confédération pour la promotion de l'innovation – CTI), the Swiss National Foundation for Scientific Research (FONDS). Special attention should be paid to the Swiss National Foundation for Scientific Research, which implements a technology transfer support policy together with CTI, promoting the fastest possible transfer of fundamental research results to practical use. So, for example, applications received by the Fund and having applied potential are transferred to CTI for examination. It is also necessary to emphasize the effectiveness of the activities of such structural divisions of the Foundation as National Research Centers (Poles de recherche nationaux PRN) and National Research Programs (Programmes nationaux de recherche – PNR), whose main task is to promote the applied use of research results. Thus, as a result of the activities of the first 14 centers (since their start in 2001), 18 enterprises were created, 138 patents and licenses were obtained, 7.600 specialized publications and 1.284 doctoral dissertations were published [14].

Germany. The interaction between the participants of the innovation process here takes place mostly thanks to such technological mediators as scientific communities, governments of individual countries, joint research associations in industry. At the same time, a number of enterprises participating in technology transfer receive certain advantages from the government (for example, small enterprises, when ordering research and development works, receive subsidies in the amount of 40% of the total cost of these works).

China. China has 120 new and high technology development zones of various levels, including 53

strategic zones. China's technological zones include zones located in central areas (Beijing, Shenyang) and even in coastal areas (Shanghai, Hainan). In one of the central districts, the second largest and most important technology park in China is located – "Nanhu", which received state status in 1991. Shenyang, on the territory of which the technology park is located, has 12 universities, 30 research institutes, 210 research laboratories, and 220 new and high-tech enterprises (30 of them with the participation of foreign capital). During the existence of the zone, about 600 new types of high-tech products were developed and put into production.

Given the competition in the technology market, Ukraine should pay attention to preserving and increasing the country's scientific and research potential. Indeed, throughout 2018, scientific research and development in Ukraine was carried out by 950 organizations, 48.1% of which belonged to the state sector of the economy, 37.0% to the entrepreneurial sector, and 14.9% to higher education [15].

At the enterprises and organizations that carried out the NDR, the number of executors of such work at the end of 2020 was 78.800 people (including part-time workers and people working under civil law contracts), of which 65.2% were researchers, 9.0% – technicians, 25.8% – support staff [14]. Moreover, over the decade, the number of all personnel decreased by 2.3 times, which indicates the degradation of the industry. The fact of the decline of science and development is particularly emphasized by the reduction in the number of the main performers of work - researchers, whose number decreased by 2.6 times, and their specific weight decreased from 73.3% in 2010 to 65.2% in 2020 (fig. 1).

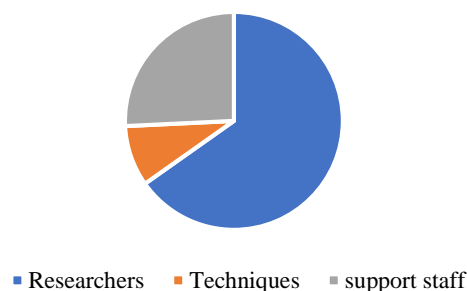


Figure 1. Structure of R&D personnel by categories for 2020

Source: compiled by authors on materials [15]

The fact that the GDR sector in Ukraine is degrading is confirmed not only by the reduction of the relevant personnel, but also by the decrease in the activity of Ukrainian companies in the field of introducing innovations into production (table 2).

During the period 2000-2020, the share of sold innovative products in the total volume of sold products of industrial enterprises steadily decreased from 9.4% to 1.9%, and this, as noted in point 2.1), is the final indicator of the innovativeness of production.

Taking into account the above, a system of measures to accelerate technology transfer processes

with the participation of Ukrainian enterprises should be formed.

First, it is necessary to find out which technologies are subject to promotion for cross-border exchange. In particular, the process of transfer of innovative technology will contain such a component as a developer, which will be absent during the transfer of existing technology [17].

Secondly, it is expedient to create conditions for Ukrainian developers of scientific and technical products to facilitate the patenting of their developments within the country and abroad. Currently, due to the lack of funds, many research

institutions and enterprises refuse to patent their innovations, translating the results of intellectual activity into unregistered production secrets (know-how). At the same time, special laws on the protection

of commercial secrets have long been in force in Moldova (1994), Kyrgyzstan (1998), Turkmenistan (2000), Azerbaijan (2001), the Russian Federation (2004), Tajikistan (2008), Belarus (2013) [18].

Table 2. Implementation of innovations at industrial enterprises of Ukraine

Indicator	2000	2005	2010	2015	2020
Share of the number of industrial enterprises implementing innovations (products and / or technological processes) in the total number of industrial enterprises, %	14.8	8.2	11.5	15.2	14.9
Number of innovative products (goods, services) implemented in the reporting year, total units	15323	3152	2408	3136	4066
Including:					
new for the market	4	4	606	548	691
machines, equipment implemented	631	657	663	966	647
Share of the volume of the sold innovative production (goods, services) in the total volume of the sold production (goods, services) of industrial enterprises, %	9.4	6.5	3.8	1.4	1.9

Source: compiled by authors on materials [16]

Thirdly, it is necessary to form a set of measures to support foreign patenting of domestic developments. After all, the costs of obtaining a patent for an invention of medium complexity and maintaining its validity during the first three years (taking into account the costs of a patent attorney) can amount to 3000-4000 euros in European countries, 7500 in the USA, and 9600 in Japan. The cost of a European patent for eight countries is estimated at 40000 euros [19]. On the other hand, in Ukraine, unlike European and many post-Soviet countries, there is no state support for foreign patenting.

Today, when military operations are taking place on the territory of Ukraine, the integration of national science into the European scientific research and educational space seems especially important to us.

1. An obvious requirement for the economy of Ukraine is the need to increase the general technological level and the level of production productivity of Ukrainian companies, since this contains the prerequisites for increasing the competitiveness of the national economy.

2. In Ukraine, it is necessary to form its own national concept of the development of technology transfer, which should provide for a comprehensive system of evaluating its effectiveness and be oriented towards increasing the level of the technological structure of the national economy and achieving leadership in strategic markets.

3. After the end of Russian-Ukrainian war, it seems expedient to prioritize the integration of the domestic innovative sector into the European research

and educational space, which will enable its accelerated development within the framework of the state's general strategy for integration into the European Union.

Conclusions

As a result of the research, the following conclusions can be drawn regarding the role of technology transfer in the work of international companies. According to the direction of movement, technology transfer is divided into horizontal (transfer of technology on a paid basis) and vertical, intra-company (the process of using technology through its own development and sale of finished products).

In recent decades, there has been a tendency to redistribute the innovative potential of the world economy thanks to the active transfer of technologies in favour of the Newly Industrialized countries, primarily the countries of East and Southeast Asia, as evidenced by the growth of their activity in the trade of patents and licenses.

Global companies occupy a particularly active position among the primary subjects of the global technology market. The peculiarities of technology transfer in different countries are analysed.

In Ukraine, it is necessary to form its own national concept of the development of technology transfer, which should provide for a comprehensive system of evaluating its effectiveness and be oriented towards increasing the level of the technological structure of the national economy and achieving leadership in strategic markets.

Abstract

In modern conditions of the development of productive forces, the implementation of technology transfer in the work of international companies is acquiring more and more important features. The progressive development of productive forces in the conditions of Industry 4.0 and 5.0 forces international companies to move faster, introducing progressive technology transfer into their work.

The main goal of this study is to consider the organizational and economic aspects of technology transfer in the activities of international companies in order to increase their level of competitiveness in international markets. It should be noted that in conditions of accelerated innovative development, new high-tech products

(Internet of Things technology, artificial intelligence, 3D modeling and design products, smartization of services, etc.) appear as a result of the introduction of innovative ideas, technologies, materials. Technology transfer at the national level also plays a big role, because it leads to an increase in the level of export-oriented development of production, services that have high-tech products, this is extremely important for the development of the national economy, which needs financial resources in the conditions of the post-war development of productive forces in the country.

The main concepts and the role of innovative development in ensuring the competitiveness of enterprises in the international business environment are studied. Factors affecting the innovative development of enterprises in the international business environment have been formed. The theoretical provisions of technology transfer in the business environment are considered. The technology transfer policy in the international work of companies is disclosed. The state of the market of international technology transfer is analyzed, indicating the features of its development in market conditions. The regulatory mechanisms of technology transfer in international companies have been studied. The problematic aspects and prospects of the introduction of technology transfer at the national level in the conditions of the post-war development of the economy of Ukraine are revealed.

As a result of the research, the following conclusions can be drawn regarding the role of technology transfer in the work of international companies. According to the direction of movement, technology transfer is divided into horizontal (transfer of technology on a paid basis) and vertical, intra-company (the process of using technology through its own development and sale of finished products).

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