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MASTER’S LEVEL QUALIFICATION PAPER

on the topic "TECHNOLOGY TRANSFER IN THE WORK OF INTERNATIONAL COMPANIES"

Specialty 292 "International Economic Relations"

Student II Course (course number) (signature) Siedieliev S.H. (full name)
group ME.m-11an (group’s code)

It is submitted for the Master's level degree requirements fulfillment.

Master's level degree qualification paper contains the results of own research. The use of the ideas, results and texts of other authors has a link to the corresponding source

Research advisor professor, doctor of economic (position, scientific degree) (signature) Taraniuk L.M. (full name)

Sumy, 2022

SUMMARY

of Master's level degree qualification paper on the theme

"TECHNOLOGY TRANSFER IN THE WORK
OF INTERNATIONAL COMPANIES"

student Siedieliev Serhii Hennadiiovych
(full name)

The main content of the master's level degree qualification paper is set out on 81 pages, including a list of used sources of 51 titles, which is placed on 5 pages. The work contains 7 tables, 4 figures, 2 annexes, which are placed on 8 pages.

KEYWORDS: TECHNOLOGY, TECHNOLOGY TRANSFER, PATENT, LICENSE, KNOW-HOW, INTERNATIONAL COMPANY, HIGH-TECH EXPORT, GLOBAL TECHNOLOGY MARKET

The purpose of the master's level degree qualification paper is to identify the implementation mechanisms and ways to improve technology transfer in the international company activities.

The object of the study is the process of innovative economic development.

The subject of the study is theoretical principles of implementation and ways of improving the exchange of technologies in the international company activities.

The following research methods were used during the performance of the qualifying master's thesis: monographic analysis (when comparing the views of scientists regarding the definition of the content of technology transfer); empirical analysis (when collecting and systematizing factual material regarding the functioning of the global technology market); comparative analysis (with cross-country and temporal comparison of indicators of the development of the innovation sphere); modeling method (when building a regression model of the

dependence of China's high-tech exports on various factors); graphic analysis (with illustrative presentation of statistical information), etc.

The information base of the master's level degree qualification paper is scientific works of domestic and foreign researchers, the main papers of UNCTAD and VIPO in terms of technological exchange regulation, information materials of official websites of OECD and EU, statistical data of the World Bank and the State Statistics Service of Ukraine.

The elements of scientific novelty submitted for protection contain the following provisions:

1) it is reasonable that a finished product or service may be the result of manufacturing using advanced technology, but the technology itself is the sum of knowledge used to create a product or provide a service;

2) the analysis found that 2021-2022 saw a recovery of the global technology market after its recession during the COVID-19 pandemic, as evidenced by the increase in the number of patent applications, trademark applications and applications for registration of industrial designs;

3) it is proposed to form Ukraine's own national concept of the development of technology transfer, which should provide for a comprehensive system of evaluating its effectiveness and will be focused on increasing the level of the technological structure of the national economy and achieving leadership in strategic markets.

Practical significance of the results obtained in the master's thesis is that they can be used in the formation of the innovative development national strategy:

1) on the basis of the regression analysis, the relevant factors of the increase in the China high technologies export as the country with highest volume were established, which can serve as a guideline for increasing the indicator for other countries;

2) the assumption of a possible slowdown in the international transfer of technologies between countries of different geopolitical groups, which have recently been opposing each other, is substantiated;

3) the leading development direction of the participation of Ukrainian companies in the international technology transfer is formulated, which consists in the integration of the domestic scientific and technical sphere into the European scientific and educational space within the framework of the general rapprochement of Ukraine and European Union economy.

Abstracts of the report were published in order of approval "Modern innovation processes and international technology transfer" Sustainable Development in Wartime Ukraine and the World.

Year of Master’s level qualification paper fulfillment is 2022

Year of Master’s level paper defense is 2022

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
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TASKS FOR MASTER'S LEVEL DEGREE QUALIFICATION PAPER

(specialty 292 " International Economic Relations ")
student II Course course, group ME.m-11an
(course number) (group's code)

Siedieliev Serhii Hennadiiovych
(student's full name)

1. The theme of the paper is «Technology Transfer In The Work Of International Companies»
approved by the order of the university from " __ " __________ 20 __ №___

2. The term of completed paper submission by the student is"___" ______20 __

3. The purpose of the qualification paper is to identify the implementation mechanisms and ways to improve technology transfer in the process of international company activities.
4. The object of the research is the process of innovative development of the economy.
5. The subject of research is the theoretical basis of implementation and ways of improving the exchange of technologies in the international company activities.
6. The qualification paper is carried out on materials of UNCTAD , VIPO and World Bank
7. Approximate master's level degree qualification paper plan, terms for submitting chapters to the research advisor and the content of tasks for the accomplished purpose is as follows:

Chapter 1 Theoretical principles of international scientific and technological exchange
(title, the deadline for submission)

Chapter 1 The essence, forms and channels of technology transfer and technological policy of international companies
(the content of concrete tasks to the section to be performed by the student)

Chapter 2 Current state of the world technology market

(title, the deadline for submission)

Chapter 2 deals with activity of global companies on the high-tech products market,national and supranational regulation of technology transfer

(the content of concrete tasks to the chapter to be performed by the student)

Chapter 3 Acceleration Of International Technological Exchange In Ukraine As A Means Of Innovative Economic Development

(title, the deadline for submission)

Chapter 3 deals with technology transfer processes, which are seen as a chance for successful competition with countries with higher technological potential.

(the content of concrete tasks to the chapter to be performed by the student)

8. Supervision on work:

Chapter	Full name and position of the advisor	Date	
		task issued by	task accepted by
1			
2			
3			

9. Date of issue of the task: " ___ " ______20 __

CONTEST

INTRODUCTION

Economy of the 21st century is based on the wide application of advanced production technologies, which ensures sufficient competitiveness of manufactured goods and services. Instead, the domestic and international spread of innovations is not possible without the involvement of such a process as technology transfer. Therefore, the problem of the technological exchange development between companies of different countries is relevant for theory and practice of international business.

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: L. Antonyuk [1], Y. Bazhal [2], M. Didkivskyi [3], A. Mazaraki [4], etc. The foreign school of innovative analysis also includes many names: P. Drucker [5], C. Christensen, A. Scott and E. Roth [6], D. Gibson {7], J. Shumpeter [8], and others.

Instead, a more detailed analysis of the topic of technology transfer is necessary due to the impact of recent global factors on the field of innovation - the COVID-19 pandemic, the intensification of competition between US and Chinese companies, the Russian-Ukrainian war.

The purpose of the qualification work is to identify the implementation mechanisms and ways to improve technology transfer in the process of international company activities.

Based on the set goal, the following work tasks were formulated:

- reveal the essence, forms and channels of technology transfer;
- find out the role of international companies in technology transfer;

- describe the current state of the global technology market;
- to show modern features of the global companies activities in the market of high-tech products;
- analyze national and supranational regulation of technology transfer;
- formulate ways of accelerating international technological exchange in Ukraine as a means of innovative economic development.

The object of research is the process of innovative development of the economy.

The subject of the study is the theoretical basis of implementation and ways of improving the exchange of technologies in the international company activities.

The following research methods were used during the performance of the qualifying master's thesis: monographic analysis (when comparing the views of scientists regarding the definition of the content of technology transfer); empirical analysis (when collecting and systematizing factual material regarding the functioning of the global technology market); comparative analysis (with cross-country and temporal comparison of indicators of the development of the innovation sphere); modeling method (when building a regression model of the dependence of China's high-tech exports on various factors); graphic analysis (with illustrative presentation of statistical information), etc.

The information base of the master's level degree qualification paper is scientific works of domestic and foreign researchers, the main papers of UNCTAD and VIPO in terms of technological exchange regulation, information materials of official websites of OECD and EU, statistical data of the World Bank and the State Statistics Service of Ukraine.

The elements of scientific novelty submitted for protection contain the following provisions:

1) it is reasonable that a finished product or service may be the result of manufacturing using advanced technology, but the technology itself is the sum of knowledge used to create a product or provide a service;

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3) it is proposed to form Ukraine's own national concept of the development of technology transfer, which should provide for a comprehensive system of evaluating its effectiveness and will be focused on increasing the level of the technological structure of the national economy and achieving leadership in strategic markets.

Practical significance of the results obtained in the master's thesis is that they can be used in the formation of the innovative development national strategy:

1) on the basis of the regression analysis, the relevant factors of the increase in the China high technologies export as the country with highest volume were established, which can serve as a guideline for increasing the indicator for other countries;

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3) the leading development direction of the participation of Ukrainian companies in the international technology transfer is formulated, which consists in the integration of the domestic scientific and technical sphere into the European scientific and educational space within the framework of the general rapprochement of Ukraine and European Union economy.

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1 THEORETICAL PRINCIPLES OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL EXCHANGE

1.1 The essence, forms and channels of technology transfer

In the modern theory of international economic relations, there is no doubt about the fundamental importance of technological innovations for economic development. New technologies are a powerful and quite effective tool capable of significantly improving the position of a particular company in competition and thus becoming a determining factor in economic development. Therefore, technologies directly determine the directions and dynamics of the economic development of national producers, and accordingly, the national economy in general.

Discussing the problem of technology development and diffusion requires a clear understanding of two basic questions: first, what is actually meant by the terms "technology" and "technology transfer" and, second, how do firms in recipient countries actually become proficient in using the received technologies.

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 techne - 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 [3, p. 14].

Close to the above understanding of the essence of technology is typical for Marxist and neo-Marxist economic theories, as well as for institutionalism. Emphasis on technology as a set of knowledge, skills, and experience brings together institutional and Marxist approaches to the study of economic phenomena.

Along with the scientific definitions of the subject of our research, its purely legal interpretation is also important. In particular, UNCTAD states that "technology" can be defined in different ways. The present problem is to make a definition for legal purposes which covers all forms of commercial use of knowledge, patented or unpatented, which may be the subject of a transfer transaction. 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].

This definition clearly excludes goods that are sold or leased from the scope of "technology". Thus, it is the knowledge used to create and deliver the product or service that constitutes the "technology," not the finished product or service as such.

Such knowledge should be seen as encompassing both the technical knowledge underlying the final product and the organizational ability to transform the relevant production inputs into a finished product or service, as the case may be. Thus, “technology” includes not only “knowledge or methods needed to continue or improve existing production and distribution of goods and services” or even to develop entirely new products or processes, but also “business experience and professional knowledge. The last two elements can often prove to be an important competitive advantage that the owner of the technology possesses.

According to the Law of Ukraine "On State Regulation of Activities in the Field of Technology Transfer", technology is the result of scientific and technical activity, a set of systematized scientific knowledge, technical, organizational and other decisions on the list, term, order and sequence of operations, the production process and/ or sale and storage of products, provision of services [10].

In our opinion, the last definition of the term "technology" is the most verified and accurate, as it indicates the sphere of technology creation, as well as reveals the algorithm of operations in the production or circulation of the latest products as a result of the use of technology.

The next stage of the research is to clarify the term "technology transfer".

Despite the long-term use of the concept of technology transfer in the literature, there is no universally accepted definition of what "technology transfer" means. Definitions tend to vary from country to country and organization to organization, with some placing a disproportionate emphasis on manufacturing capacity as the most valuable form of technology transfer to recipient countries.

For the purpose of generalization and comparison, we present several definitions of technology transfer most common in the economic literature (Table 1.1).

Table 1.1 - Overview of the different definitions of technology transfer [11, p. 10]

Year	Author	Definition
1	2	3
1983	McCarde!	Techitelpgy transfer is The process of communicating research results to potential users"
1990	Souder,S'ashar. and Padmanabhan.	The transferring technology process is actually и integration process involving provider and receiver. Technology transfer is not a unidirectional process, but a dialogue between varieties of actors al the sender/receiver sitefs) at any point in lime.
1993	Padma nah han and Souder	‘Technology transfer is the managed process of Successfully conveying a technology from Some point of Ori gin lo iLS routine application among users”

Continuation of table 1.1

1	2	3
1995	Spann,.4danut and Souder	“Technology transfer has been generally defined as the managed process of conveying a technology from one parly io its adoption by another".
2000	Robert Krull	Technology transfer is a process by which existing technology is transferred or transformed to fulfill the user’s needs. Technology transfer is the process by which research and other new technologies are transferred into useful processes, products, and programs. Another way of saying the same thing is: technology transfer is (he process by which a belter way of doing something is put trio use as quickly as possible
2001	Hill	Technology transfer as a process through which resources are trarbferred in the development Of products and Services between the organizations.
2010	Chen el al.	Technology transfer is the process of sharing of skills, knowledge, technologies, methods, and samples of manufacturing, and facilities among govemmerls, and other institutions to ensure that scieriific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, application, materials or services.

Meanwhile, technology transfer is often understood as the exchange of scientific and technical achievements. At the same time, such concepts as: "technology transfer", "technological exchange", "technology sale", "technology diffusion", "technological assistance" and others are used as synonyms.

"Technology transfer" is the process of spreading commercial technology. It takes the form of a technology transfer transaction, which may or may not be covered by a legally binding contract, but which involves the transfer of relevant knowledge to the recipient. In a broader sense, technology transfer is a scientific and technological exchange between subjects of innovative and entrepreneurial activity.

Characteristic features of scientific and technological exchange are [12, p. 486]:

- 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;
- a rate of innovation diffusion is determined by the possibilities of their perception by country's economy at the corresponding stage of socio-economic development and the necessary resources availability;
- forms and rates of technological exchange development are closely related to the features of the state's economic development.

A difference between technology exchange and traditional commodity exchange is that this process is not a one-time act of buying and selling, but leads to the establishment of long-term relationships necessary for the implementation of technology, which includes its development, personnel support, repair, updating, etc.

Therefore, the transfer of technologies is interpreted as the transfer of systematized knowledge for the production of appropriate products, for application of appropriate process or provision of appropriate services in order to increase the buyer competitiveness. According to the definition of the World Intellectual Property Organization, technology transfer is the process of practical application of the results of research and development works [13].

By geographic feature, technology transfer is divided into national, which occurs between domestic scientific institutions, industrial and commercial enterprises of the state or private sector, and transnational, which includes domestic and foreign subjects [14]. The subject of our research is international technology transfer.

The main subjects of international technology transfer are the state, enterprises, research organizations, universities, private individuals - inventors, and international organizations of the regional and world level. Therefore, the system of permanent relations between countries of the world regarding the purchase and sale of technologies form a special segment of the world market - the world technology market.

Technologies in tangible and intangible forms, as well as in the form of factors of production, are the objects of international technology exchange. Material technologies as a method of production, a method of obtaining and processing various materials, a set of equipment and tools can take the form of:

- invention (useful model) - the result of intellectual activity in any field of technology (device, substance, new application of a known product);
- industrial design - the result of intellectual activity in the field of artistic design to meet ergonomic needs (shape, drawing);
- integrated microcircuit - a microelectronic product of final or intermediate form, designed to perform the functions of an electronic circuit, the elements and connections of which are integrally formed in the volume and (or) on the surface of the material that forms the basis of such a product;
- topography of an integrated microcircuit - the spatial and geometric arrangement of the set of elements of an integrated microcircuit and the connections between them recorded on a material medium.

Intangible technologies are knowledge about how to create tangible technologies and which are provided in the following form:

- patent - a document certifying the state recognition of a technical solution as an invention and securing the exclusive right to the invention for the person to whom it was issued;

- license - documentary permission to use a patent or "know-how" with the right to produce certain products;
- "know-how" in practice is considered as undisclosed knowledge, experience, technological documentation, innovative proposal, production secrets, etc., for which there is no protective document [14].

Within the framework of the theory of international economic relations, technology transfer can be considered as international trade in a specific product or as an international movement of factors of production, that is, a resource that must be spent to produce a product. Therefore, technology carriers can be goods and other production factors (labor, capital, land):

- goods - in the case of international trade in high-tech goods;
- capital - under the conditions of international trade in high-tech capital-intensive goods;
- land - under the conditions of trade in natural resources, for the development of which the latest scientific and technological achievements are used.

According to the direction of movement, technology transfer is divided into horizontal and vertical. Horizontal transfer of technology means the transfer of technology on a paid basis from one economic entity to another. Vertical (intra-company, quasi-market) transfer is understood as the process of implementing the function of using technology through its own development and sale of finished products [15, p. 19].

Depending on the stage of technology transfer, the following can be resorted to:

- newly formed companies;
- operating companies;
- departmental laboratories, universities and their associations.

The first and second types of technology transfer have the greatest impact on achieving short-term financial gains and increasing the market share of a specific manufacturer. The third type contributes to the increase of research resources and the long-term impact on industrial competitiveness and the level of national security. The specified forms of transfer are interconnected and constantly transition into each other during the life cycle of technologies and can occur simultaneously or in parallel.

The channels through which technology is transferred are divided into commercial and non-commercial.

Commercial agreements on technology transfer, as defined by the OECD, may include the following [14]:

- transfer of technical means for the use of patents and licenses;
- transfer of know-how (sale of technologies in a materialized form, patents and licenses for all types of patented industrial property);
- transfer (sale, licensing, franchising of projects, trademarks and samples);
- providing services of a technical nature, including technical assistance (technical training, project consulting, technological, construction and management engineering, joint R&D development, research and production cooperation);
- transfer of R&D results (direct and portfolio investments in construction, reconstruction, modernization of companies, industries).

The nature of commercial agreements in the field of international scientific and technological exchange makes it possible to distinguish channels of technology transfer:

- international trade in science-intensive products;
- licensed trade;
- knowledgeable service;
- international scientific and technological cooperation (commercial and non-commercial);
- complex transfer of technologies, which combines all of the listed channels or some of them.

The choice of the organizational form of technology transfer is influenced by such factors as its importance in the production process, the characteristics of a personnel and organizational form of the enterprise, the depth of changes in the production process and the scale of introductions into production. A distinction is made between the diffusion of knowledge (non-commercial transfer) and the commercial transfer of technologies.

Technology transfer on a non-commercial basis includes:

- scientific and technological publications - scientific, technical and educational literature, computer data banks, reference books and analytical studies, technical standards and instructions, company catalogs and prospectuses, patent descriptions;
- personal contacts of scientists and specialists in the process of exchanging information at international conferences, exhibitions, symposia, seminars, as well as as a result of business trips abroad, training, internships;
- the migration of scientists and specialists, or the so-called "brain drain".

The main methods of technology transfer on a commercial basis are leasing, franchising (a commercial concession under domestic law) and a license agreement [10].

1.2 Technological policy of international companies

Many subjects of the innovation system participate in the process of international technology transfer. Entities operating at the mono- and micro-levels mostly include small and large companies, universities and scientific institutions, and venture capital firms. At the meso level - TNCs, scientific and technical complexes, national companies, and at the macro level - states with innovative systems. However, generation of technologies in one form or another is carried out by micro-level companies.

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;
- “locally-leveraged” (distribution system of technological development) - includes the use of resources of the national branch in order to create innovations for the local and global market;
- “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.

The research component of new technologies is often generated by state-owned scientific institutions. Mono- and micro-level subjects are important in innovation processes, as new knowledge is generated and successfully commercialized on the market with their participation. The main producers of innovations in highly developed countries are state laboratories, research organizations and universities. The state provides active comprehensive support to these institutions. Encouraging fundamental research in the field of high technologies or new knowledge is now considered the basis of economic growth. Thus, according to estimates by American experts, $1 invested in R&D leads to $9 in GDP growth [1, p. 81].

Historically, various structures that conduct scientific research and design development have developed in different states. In the Netherlands, it is the Organization for Applied Research, the Organization for Scientific Research. In Germany — Max Planck Society, Fraunhofer Society. In the USA, there are powerful federal laboratories (for example, the laboratory of the National Institute of Health), the number of which exceeds 700. They are equipped with the most modern devices and equipment, indispensable for the research activities of universities, private corporations and for maintaining the competitive position of American products on the world market.

The main amount of funding for fundamental research comes from the budget.

A feature of the American innovation system is significant federal support for research and development in universities, since it is there that most of the long-term strategic scientific and technological research is carried out. In addition, the potential of these institutions is attractive for private corporate laboratories and industrial enterprises, students in the United States and around the world. Current federal spending has recently been about 1 % of US GDP (total spending on research and development over the past three years has reached $220-225 billion), which has ensured successful scientific activity in many new technologies.

The American government supports progressive forms of business cooperation with universities in the process of R&D. Industry gains competitive advantages from research partnerships with these institutions. Many large corporations allocate significant funds to finance research. That is, the American government, together with private foundations and venture capital, provides funding for fundamental scientific research. Therefore, science gets the opportunity to participate in private business, universities — to patent products developed by them. Such patenting provided a significant part of the funding of basic science in the USA, which is also comprehensively supported by the regional government structures of individual states through various programs.

Therefore, it is not without reason that most researchers believe that the US economy as a whole is technologically and innovatively the most dynamic in the world. Although the economies of the EU countries and Japan are also characterized by a high degree of innovation, they lag far behind the USA in terms of university-private business connections, which are designed to attract new ideas into the economic circulation. In addition, universities mostly have the right to conduct commercial activities and own patents for their own inventions.

Significant innovation potential has been accumulated by Chinese companies in recent years. Taking advantage of the extensive technology transfer during the 1990-2000 years, Chinese business took a big step forward, mastering and applying the latest Western technologies in their production.

Among the micro-level entities that carry out scientific and research activities, universities are of great importance. They form a significant network of innovative infrastructure. They create and develop various technology generation and transfer centers, innovation centers, business incubators, technology parks, which promote the selection of promising scientific developments and their dissemination, various assistance is provided to small businesses. Mostly this happens with the help of local authorities. Scientists and leading scientists of universities are able to create their own companies or participate in portfolio investment [17].

World experience shows that technology, science and education are a single segment of the market. In leading countries, the share of investment in education is from 12 to 21 % of GDP. Each state's policy on the development of professional education has its own peculiarities, but everywhere it is oriented towards the formation of human capital. The European system of higher education is not inferior to the American system in terms of the quality of training of scientists. But the latter reacts more quickly to the emergence of new technologies and industries, expanding the training of necessary specialists and the research of critical technologies.

In Germany, for example, considerable attention is paid to special programs that give graduates the experience and qualifications to start their own companies. In the Benelux countries, special importance is attached to providing opportunities for young specialists, having obtained a profession, to participate in international scientific and technical programs. English universities are trying to attract foreign companies working in the field of electronics, mechanical engineering, etc. to cooperation.

The creation of competitive innovative advantages depends on the interaction of fundamental science, which gives rise to new technologies, and its commercialization in new products and production processes. If scientific research (especially fundamental) is mostly conducted in non-commercial institutions, then the implementation of innovations takes place in market conditions, mainly at enterprises.

Considering the need to take into account the innovative component in their development strategies, international companies pay attention primarily to the use of creative thinking of their personnel, their ability to generate innovations in production and business organization.

In order to remain prosperous and profitable in the uncertain and competitive business environment of the 21st century, many companies have found that they must solve the challenges before them using new and unconventional approaches. As a result, organizations demand from their employees new ideas and new non-traditional solutions in the process of performing their work functions.

Today, the management of international companies is faced with a whole set of complex topics and problems. Among them, we highlight the following [18, p. 27]:

- What new products and services can the company develop, produce, distribute or sell?
- How can you provide added value to your products and services for consumers?
- How should you position your products, services, and processes so that they stand out from what your competitors are doing?
- How well is the company serving its current market segments and how can it improve?
- Which of the markets where the company does not currently exist could be served?

To answer these questions, companies are looking for ways to use creative approaches to solve their problems and find new opportunities. They need to invent new ways of designing, producing and distributing products, services and information. And they need employees who can help the company grow. As a result, corporate competencies and models of organizational behavior, which are currently becoming the most important for the competitiveness and efficiency of the company, are centered on creative approaches: employees who want to be successful must learn to destroy traditions, generate and develop new ideas, and finally fulfill their daily work in a new way.

So, summing up the clarification of the theoretical content of the concept of "technology transfer" and its use in the practical activities of international companies, we can note the following points.

1. Most authors agree that technology is the result of scientific and technical activity, a set of systematized scientific knowledge, technical, organizational and other decisions about the list, term, order and sequence of operations, the process of production and/or sale and storage of products, provision of services . In turn, technology transfer means the exchange of scientific and technical achievements in one form or another.

2. By geographical feature, technology transfer is divided into national, which occurs between domestic scientific institutions, industrial and commercial enterprises of the state or private sector, and transnational, which includes domestic and foreign entities.

3. The main subjects of international technology transfer are the state, enterprises, research organizations, universities, private individuals - inventors, and international organizations of the regional and world level. Technologies in tangible and intangible forms, as well as in the form of factors of production, are the objects of international technology exchange.

4. Ready goods, as well as factors of production (labor, capital, land) can act as technology carriers:

5. 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).

6. The channels through which technology is transferred are divided into commercial and non-commercial. The main methods of technology transfer on a commercial basis are leasing, franchising (commercial concession) and license agreement.

7. In their technology transfer activities, international companies are guided by such types of technological policies as "center-for-global", "local-for-local", "locally-leveraged", "globally-linked".

2 INTERNATIONAL COMPANIES IN THE WORLD TECHNOLOGY MARKET: LATEST TRENDS AND REGULATION

2.1 Current state of the world technology market

Modern innovation processes in the conditions of globalization of economies require states to intensively exchange scientific and technical achievements, expand sales markets for science-intensive products, change the structure and content of national innovation systems. At the beginning of the 21st century, a new paradigm of transnational innovative activity is emerging, which is characterized by intensive commercialization of technologies on the market, the presence of many knowledge centers located in different regions, and especially technology transfer. Scientific information is actively exchanged on a bilateral basis between various subjects of the global economy. International research and development, the production of knowledge-intensive products, the active efforts of the governments of various countries aimed at attracting foreign direct investments that create high added value, as well as attempts to obtain intellectual property rights in exchange for access to sales markets, investing in human capital - all it stimulates the emergence of new international innovators.

The features of international technology transfer at the current stage are as follows [1, p. 42]:

1. Increasingly, the technology transfer agreement includes a set of services in the form of technical assistance, specialist training, etc. Therefore, in the practice of international economic cooperation, the algorithm "equipment + services + technological knowledge" is replaced by the opposite formula "technological knowledge + services + equipment".

2. Orientation of the scientific and technological policy of the enterprise not on the development of new technologies, but on the timeliness of their application,

which makes the purchase of technologies a more profitable operation than their sale.

3. 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 %.

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

5. 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.

6. 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 [13].

7. Activation of international technical cooperation by consolidating the efforts of high-tech enterprises of different countries to jointly solve scientific and technological problems. This is explained by the increase in the capital intensity of production and the desire to shorten the period of setting up the production line. It has been established that technical cooperation shortens the period of setting up the production of new products by an average of 1-2 years compared to the

organization of production exclusively by own forces, and also reduces the cost of development of production by 50-70 %. Cooperation makes it possible to achieve more than 90 % of the quality level of a foreign partner's products, while the development of foreign technology on one's own makes it possible to ensure only 70-80 % of this indicator.

8. 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).

9. Using the "compete with the few, cooperate with the rest" principle for technological alliances. Such organizational structures include the following associations: Airbus and Eurfight, Boeing and Samsung Electronics, joint venture Eurocopter (association of TNCs in the aviation sector), MCC and Sematech (union of TNCs in the field of computer equipment production).

10. 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.

11. Internationalization of innovative activities. As a rule, its activation is caused by the activities of TNCs, which seek to increase their presence in foreign markets. At the same time, TNCs are gradually moving their scientific and research units abroad, giving preference mainly to countries with a similar level of technological development. But exceptions are possible for developing countries or countries with transitive economies, which get the opportunity to increase their potential for integration into global R&D networks. An example of the most attractive countries for TNCs to carry out R&D is China. The trends of

internationalization of the scientific and technological sphere have the following forms:

- global use of technologies - export of goods, means of production, capital, licenses, technical assistance, distribution of patents abroad, production facilities abroad;
- global cooperation - scientific and technological cooperation within states, international scientific and technological cooperation, international inter-corporate R&D agreements;
- global production of technologies - international activities of TNCs in the field of research and technologies for the production of inventions.

In today's conditions, innovations are very important in those industries classified by the OECD as high-tech: aerospace and pharmaceutical industry, microelectronics, high-precision, computing and optical technology, software, robotics, nanotechnology, artificial intelligence, information technology, etc. [14] . An even more detailed classification of high-tech production is given by Thomas Gatsichronoglou [19]. The high-tech industries include many military industries, as evidenced by the current war in Ukraine: rocket and space, aviation and aircraft engine construction, armored and engine construction for armored vehicles, shipbuilding, including the creation of underwater remote-controlled vehicles, modernization of modern military equipment, creation of electronic-optical products , navigation devices, homing heads for surface-to-air, air-to-air missiles and artillery shells, radio technical control stations, sound-metric artillery reconnaissance systems, complex control systems, radio communication equipment, radio engineering and radio electronic warfare, creation of unmanned aerial vehicles, aviation and missile systems aiming, nanoelectronics, high-speed data transmission, IP-telephony, creation of lightweight super-strong materials, welding of heterogeneous surfaces. The development level of high technologies in each country is determined by the volume of production and export. According to the Global Insight World Industry Service database, in the last decade the volume of global exports of high-tech products has doubled to $2,3 trillion. Among high-tech products, the majority of which are information and communication technologies, most of the exports go to developed countries ($1,4 trillion). Exports of developing countries are estimated at $0,9 trillion, Japan and the developed countries of Western Europe are considered the main centers where the world's technological resources are concentrated [20]. However, in recent decades, there have been significant changes in the geographic structure of the supply of high-tech goods to the world market. The leadership in this area is gradually being taken over by the innovation-oriented economies of East and Southeast Asia [21]. In 2020, companies from China, Hong Kong, Germany, the Republic of Korea, Singapore, the USA, Japan, Vietnam, Malaysia, and the Netherlands took the lead in terms of the absolute volume of exports of high-tech products (Table 2.1).

Table 2,1 - High-technology exports (bln. US$) [22]

Countries	2007	2010	2015	2020
1	2	3	4	5
China	342,6	474,3	652,2	757,5
Hong Kong SAR, China	2,7	2,5	453,1	340,1
Germany	169,5	179,6	199,4	182,3
Korea, Rep.	106,5	132,1	147,0	164,0
Singapore	109,3	131,8	138,7	159,9

Continuation of table 2.1

1	2	3	4	5
United States	240,5	166,0	175,2	141,5
Japan	128,3	129,8	98,2	102,8
Vietnam	-	6,1	47,5	101,5
Malaysia	-	65,7	64,5	92,1
Netherlands	83,7	77,5	69,7	87,1
France	85,8	105,2	109,6	87,1
Mexico	-	49,2	60,2	71,0
United Kingdom	68,9	66,7	74,6	58,1
Thailand	32,5	37,2	38,8	45,8
Ireland	31,6	23,3	30,6	42,4
Czechia	16,6	20,4	24,8	39,6
Philippines	-	-	-	34,9
Belgium	28,3	18,1	22,6	34,4
Italy	27,8	29,3	30,1	32,9
Switzerland	36,2	43,6	53,8	20,2

An the period from 2007, when the World Bank first began to calculate the indicator of the volume of exports of high-tech products, until 2020 the dynamics of this indicator were the highest in Hong Kong, where it increased 126 times), the Czech Republic (2,4 times), China (2,2 times), the Republic of Korea and Singapore (1,5 times). Some developed countries, on the contrary, demonstrated a downward trend in the sale of high-tech products abroad, for example, the United Kingdom, Japan, the USA, and Switzerland. The reason for this phenomenon lies in the fact that, thanks to technology transfer and direct foreign investment by companies in developed countries, many labor-intensive and harmful industries have been moved to developing countries. This applies to enterprises of metallurgy, microelectronics, the chemical industry and some other industries.

As a result of the active transfer of technologies and their widespread use by local companies, significant shifts took place in the structure of national economies, where a certain number of countries with a large share of high-tech exports stood out, characterizing them as innovative systems. According to the World Bank, the economies of Hong Kong, the Philippines, Singapore, Malaysia, Vietnam, the Republic of Korea, Malta, and Kazakhstan had the highest share of high-tech exports as part of industrial products 2020 (Table 2.2).

Table 2.2 - High-technology exports (% of manufactured exports) [22]

Countries	2007	2010	2015	2020
Hong Kong SAR, China	21,62	36,80	12,30	69,65
Philippines	-	-	-	63,05
Singapore	48,48	52,32	52,21	55,45
Malaysia	50,86	49,30	48,47	53,82
Vietnam	8,83	13,13	36,37	41,74
Korea, Rep.	32,22	32,07	31,21	35,71
Malta	53,02	47,17	30,79	34,62
Kazakhstan	-	35,36	43,43	32,96
China	30,15	32,12	30,42	31,28
Israel	7,63	19,38	22,90	28,20
Iceland	60,71	21,16	20,14	27,96
Thailand	27,89	26,27	23,91	27,67
Ireland	30,77	22,91	28,34	25,66
France	20,10	26,29	28,18	23,14
Netherlands	29,03	27,83	24,05	23,14
United Kingdom	20,86	23,29	22,32	23,00
Czechia	15,24	17,86	17,73	22,58
Norway	17,93	20,37	22,26	22,25
Mexico	20,57	22,14	19,57	21,51
Australia	14,53	16,51	19,69	21,49

During the period 2007-2020, the largest structural shifts occurred in the composition of exports of such countries as Vietnam, Israel, Hong Kong, the Czech Republic, and Australia. The share of high-tech goods in industrial exports increased 4,7 times in Vietnam, 3,7 times in Israel, 3,2 times in Hong Kong, and 1,5 times in the Czech Republic and Australia. Instead, European countries (Ireland, Netherlands, Malta, Iceland) show a tendency to decrease the specific weight of innovative goods in industrial exports.

Taking into account the data in Tables 1 and 2, as well as the indicators of scientific, technical and financial activity of countries, which are provided by the World Bank in the database "World Developments Indicators" [22], we will build a regression-correlation model of the influence of some technical and financial indicators on the technological level of development of countries . First of all, we are talking about a country like China, which has shown significant progress in the growth of high-tech products exports (see Table 2.1). In addition, there are complete data on this country for the studied period of 2007-2020, presented in the table B.1 of the annex.

The following indicators are adopted as model variables:

Y - High-technology exports (current US$)

X_1 - Foreign direct investment, net inflows (BoP, current US$)

X_2 – Industrial design applications, nonresident, by count

X_3 – Patent applications, nonresidents

X_4 - Scientific and technical journal articles

X_5 - Technical cooperation grants (BoP, current US$)

After processing the array of data using the Excel spreadsheet and the regression function from the "Data analyzis" package, we obtained a 5-factor model of the volume dependence of the high-tech products exports from China on the above factors:

$$Y = 1{,}665E^{+11} + 0{,}572\ X_1 - 139320042\ X2 + 4714287\ X_3 + + 167738\ X_4 - 174{,}653\ X_5 \quad (2.1)$$

The quality of the obtained model turned out to be quite acceptable. The R^2 indicator was equal to 0,988, that is, almost 98,8 % of the resulting indicator depends on the selected factors.

However, testing the model using the Student's test showed that factors X_2 and X_5 are insignificant and should be discarded. After new iterations of recalculation, the models obtained regression equations of the following type (R^2=0,975):

$$Y = -1{,}42908E^{+11} + 0{,}766\ X1 + 3624882\ X3 + 342373\ X4 \qquad (2.2)$$

Thus, within the built regression model of the dependence the of high-tech exports volume China on several factors, we can draw the following conclusions:

- The hypothesis regarding the choice of 5 main influencing factors (X1, X2, X3, X4, X5) on the final parameter turned out to be quite correct, since these factors determined 98,8 % of the change in Y;
- In the end, the relevant factors for the growth of China's high-tech exports were the inflow of foreign direct investment (X_1), the number of non-resident patent applications (X_3), and the number of articles in scientific and technical journals (X_4);
- Verification of the model based on Fisher's test gave positive results.

2.2 Activity of global companies on the high-tech products market

Representatives of international business are well aware that technology transfer is a way to innovative development of the company, strengthening its market position and expanding sales. For the donors of this process, it provides an opportunity, along with direct foreign investment, to penetrate foreign markets and gain a foothold in them thanks to technological leadership. For the recipients, technology transfer opens up opportunities to attract advanced science and technology assets to their own production. Not having research units, the recipient company buys the relevant license or know-how on the international market, improving its production, reducing the cost of production and increasing its quality. Thanks to the transfer of technology, the donor company has the opportunity to use it in the production process in a foreign branch or branch. Therefore, the activity of technology transfer companies in paid or free forms is beneficial to both sides of the agreement.

Active scientific and technological policy is especially widely used by large American and Chinese companies, seeking to increase the efficiency of production and its management. Trade in scientific and technological products has become a routine for them.

Based on the rating compiled by MIT Technology Review, a jornal published by the Massachusetts Technology Institute, the first 20 companies out of 50 are presented, which "by combining high technologies and business qualities, change this world" [23]. In addition to such giants as Amazon, Apple, IBM or General Electric, the rating of 50 "smartest" companies also includes ambitious young companies SpaceX (changing the economics of space travel), Face ++ (pioneer in facial recognition technology), Carbon and Desktop Metal (technological companies operating in the 3D printing market). However, the "giant companies" are clearly inferior to the "newbies": 9 of the top 20 companies in the ranking have a market capitalization below 20 billion US dollars. The list of the most innovative companies in 2017 was headed by Nvidia thanks to its work on IT technologies for self-driving cars (Table 2.3). In second place is SpaceX, which made a breakthrough in rocketry associated with successful repeated launches of multiple rocket first stages. Third place was taken by Amazon, downgrading from 2016, when it was the absolute leader in the innovative industry.

Table 2.3 – Top 20 innovative companies by version of MIT Technology Review of 2017 [23]

Ranking	Company	Ranking	Company
1	Nvidia	11	Face ++
2	SpaceX	12	First Solar
3	Amazon	13	Intel
4	23andMe	14	Quanergy Systems
5	Alphabet	15	Vestas Wind Systems
6	iFlytek	16	Apple
7	Kite Pharma	17	Merck
8	Tencent	18	Carbon
9	Regeneron	19	Desktop Metal
10	Spark Therapeutics	20	Ionis Pharmaceuticals

Chinese companies iFlytek (engaged in voice recognition technology, manufactures products controlled by voice commands) and Tencent (owner of the largest Chinese social network WeChat) broke into the top ten, which was firmly held by American companies. Chinese and American technology companies are striving to gain an advantage in the field of artificial intelligence, and also occupy leading positions in the market of platform business models. These two largest technology corporations are also ahead of other countries in terms of venture capital investments. At the same time, it should be noted that thanks to the basing of branches of high-tech TNCs in these countries, they have access to global innovations and technologies, and due to this, they can develop their own high-tech industry [21].

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 company transfers digital technologies under several types of licenses (Table 2.4).

Table 2.4 – Types of licenses for Microsoft products [24]

License type	Content of the license
Microsoft License Pack	license pack (only licenses)
Multiple User Lic	multi-user license together with media
Open	open (corporate) license
Run Time License	runtime system license
Single User License	a normal single-user license together with the media

It is important to understand that all products, package types and license types can be combined. In particular, the Run Time License exists only for products that have runtime libraries (and this type of license is not aimed at the end user, but at organizations that develop products on Microsoft platforms), and the Government package can only exist as an open license.

When installing, copying, using a Microsoft software product, a license agreement is entered into between the individual or legal entity and Microsoft Corporation for the software product accompanied by this license, which includes the software recorded on the corresponding media, any printed materials and any "embedded" or "electronic" documentation.

The global company Google - a division of Alphabet (see Table 3) 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 [25]:

- 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.

As an organization, Google supports a portfolio of research projects based on fundamental research, new product innovation, product contribution, and infrastructure goals, while giving individuals and teams the freedom to focus on specific types of work. The company creates an environment conducive to many different types of research at different timescales and risk levels. In recent years, computing has expanded as an industry and grown in its importance to society. Similarly, the research done at Google has expanded dramatically, becoming more important than ever to its mission. As such, Google's research philosophy has become more expansive than a hybrid approach to research, and now includes a significant amount of open-ended, long-term research driven more by scientific curiosity than current product needs. Google believes that successful industry research requires managing a portfolio of projects with time horizons, risk levels, and goals that align with the organization's mission. The company's approach to research has always been flexible, but there are two reasons why today's research philosophy adds more fundamental or "purely basic" research than it used to.

- Google's increasingly diverse business, long-term perspective, and greater scale allow it to pursue ambitious projects that involve more technical risk than ever before. The company's hybrid research model was tailor-made to succeed in this environment, but found it needed to be scaled up.
- Machine learning (ML) is a transformative technology that touches everything a company does [26].

Therefore, fundamental advances in machine learning technology are likely to benefit the entire organization, even if they are developed without a strong connection to a specific application or product.

Specific applied developments of the company relate to the following areas [27]:

- Algorithms and Theory
- Data Management
- Data Mining and Modeling
- Distributed Systems and Parallel Computing
- Economics and Electronic Commerce
- Education Innovation
- General Science
- Health & Bioscience
- Hardware and Architecture
- Human-Computer Interaction and Visualization
- Information Retrieval and the Web
- Machine Intelligence
- Machine Perception
- Machine Translation
- Mobile Systems
- Natural Language Processing

- Networking
- Quantum Computing
- Robotics
- Security, Privacy and Abuse Prevention
- Software Engineering
- Software Systems
- Speech Processing
- Meet the groups behind our innovation
- Our teams advance the state of the art through research, systems engineering, and collaboration across Google.

For each of the listed areas of applied research, the company has significant achievements in the form of a software product or certain services that are distributed among consumers both free of charge and on a commercial basis. Products such as ClassRoom for the educational process in schools and higher education institutions, the GoogleDrive cloud storage, the fairly high-quality machine translator GoogleTranslate, and others have become particularly successful forms of the transfer of Google's digital technologies. Adapted for individuals and organizations, these products have become widespread today and have become a bright sign of the era of digitalization.

Amazon has a high rating among innovative companies. It ranks third (see table 3). Its main achievement is the creation of the store of the future based on artificial intelligence with Amazon Go, and the intelligent voice assistant Alexa extends to phones, cars and more.

In addition, Amazon can serve as an example of management technology transfer. Among the 12 principles of leadership, she enunciates the principle of ingenuity and simplification. Amazon calls for new ideas and simplifying products if it makes them more comfortable [28]. For example, in Amazon supermarkets, you do not need to stand in line at the checkout. The customer chooses everything he needs, leaves the store, and the receipt comes to the application. This is a vivid example of the company's desire for simplification. They also practice an inventive approach based on the idea of hopelessness. When the idea turns out to be unsuccessful, a person finds himself in a hopeless situation. However, if customers embrace these innovations, dead ends turn into opportunities. For example, the cloud computing platform Amazon Web Services only started to bring profit to the company in 2018. Amazon earned more than $25 billion, although the platform was launched and developed since 2006 [28]. Instead, successful organizational innovations spread to all divisions of the company, and they take the form of transfer of advanced management technologies.

In the wave of the spread of the COVID-19 pandemic, which covered most countries since 2020, the role of technological development of pharmaceutical companies, which actively solved the problem of developing and manufacturing drugs against the new disease, increased. Thanks to the international transfer of technology, drugs for the treatment of the disease and vaccines for its prevention have been developed and put into production in large quantities. Thus, one of the most progressive was the American company Pfizer, which was recognized as one of the most profitable in this field in 2021 [29]. Its COVID-19 vaccine Comirnaty boosted the company's 2021 sales revenue to $81,29 billion. After receiving FDA approval for its COVID-19 vaccine in late 2020, the drugmaker has spent much of the past year in the public arena fighting the pandemic.

As part of Pfizer's partnership with the German company BioNTech on the development of a vaccine against COVID-19 Comirnaty, the manufacturers combined technological capabilities and shared the costs of developing the vaccine and, accordingly, the profits. Last year, Pfizer and its manufacturing partners produced more than 3 billion doses of vaccines.

Although Pfizer delivered a huge jump in sales revenue last year — up 94 % from $41,9 billion 2020 — growth in cost of sales was almost as sharp. The company's cost of sales increased to $30,8 billion 2021, which is 266 % more compared to $8,4 billion 2020, Pfizer CentreOne, a global contract development and manufacturing and active pharmaceutical ingredients business, also grew revenues last year by 84 % to $1,73 billion.

After taking into account $12,7 billion operating, general and administrative expenses, as well as $13,8 billion spending on research, development, etc., Pfizer brought in almost $22 billion net profit to shareholders last year. That's $3,85 earnings per share compared to $1,71 a year earlier Pfizer's net profit was 27 % of revenue.

In addition to these gains, Pfizer shareholders also received an increase in the share price during 2021. It rose approximately 60 % in 2021 and ended the year at $59 per share.

As one of the world's largest companies in the field of health care, Johnson & Johnson naturally ranks high in the rankings of innovation in the pharmaceutical industry. The latest biotechnologies are transferred here between 260 subsidiary companies located in 60 countries of the world, where 134000 employees work. However, contrary to expectations, Johnson&Johnson's profitability figures 2021 are not at all that impressive, which is due, among other things, to the fact that the company's business includes low-margin areas of health care and medical devices. However, Johnson & Johnson's large pharmaceutical division brought in a significant portion of the company's revenue last year.

2021, Johnson & Johnson received almost $21 billion net profit at $93,78 billion global sales. Segmentation shows where Johnson&Johnson makes most of its profits.

In pre-tax earnings, Johnson&Johnson's pharmaceutical business last year was $18,18 billion, or 35 % of sales. This indicator for goods of the consumer group was $1,29 billion, which corresponds to 9 % of sales, and $4,37 billion — for the group of medical devices, or 16 % of sales. In general, the cost of the company's sold products amounted to $29,9 billion last year, and sales, marketing and administrative expenses — $24,7 billion. Both figures are down as a percentage of total sales compared to 2020. Cost of goods sold decreased because the company improved supply chain efficiency in the consumer health group, among other things, and because its pharmaceutical business accounted for a larger share of sales.

Johnson&Johnson also spent $14,7 billion on R&D last year, or 15,7 % of total revenue. These figures were up from 2020, Johnson&Johnson said that this increase in spending was driven by the development of the product pharmaceutical division, including investments in research related to COVID-19. Again, the pharmaceutical division received most of the R&D investment ($11,88 billion).

In general, Johnson & Johnson ended the year with sales of $93,78 billion. After taking into account 2$4,66 billion operating, general and administrative expenses, $14,7 billion the company received $20,88 billion in expenses for R&D and other items net profit, or 22 % of total revenue. For Johnson&Johnson shareholders, this converted to $7,81 earnings per share, reflecting a significant jump from $5,51 an 2020.

Well-known Swiss pharmaceutical company Roche has had to deal with pressure from biosimilars on its three most popular anti-cancer drugs in 2021, resulting in a loss of 4,5 billion Swiss francs in global sales for the year. Despite this blow, the company's pharmaceutical division managed to increase sales by 3 % compared to 2020 thanks to new medicines and products against COVID-19. At the same time, the cost of production increased by 22 % to 19,65 billion Swiss francs. In addition, Roche's marketing, research and administrative expenses increased by 5 %; 15 and 11 %, respectively, compared to 2020.

Overall, Roche's sales fell to 62,8 billion Swiss francs last year, down 9 % from the same figure in 2020. Royalties and other income boosted total revenue to nearly 66 billion Swiss francs. Roche's after-tax revenue was 13,93 billion Swiss francs, down 3 % in Swiss francs.

In the conditions of the Russian-Ukrainian war and the aggravation of geopolitical conflicts, the role of technology transfer in defense industries is growing. Military industrial companies are large holders of patents and licenses for the production of the latest types of weapons. Ekonomiko — statistical analysis of the indicators of patent offices, analysis of the legislation of foreign countries and international treaties in the field of intellectual property proves that technologies for military purposes are not only recognized as objects of intellectual property, but are also widely used on the territory of foreign countries. Yes, US military departments (according to the USPTO) own thousands of patents. In the British defense industry, the widespread use of intellectual property objects as a means of strengthening market positions has gained such momentum that the leadership of the Ministry of Defense Industry has declared their threat to the competitive environment in the defense market. Thus, BAE Systems is the third largest defense company in the world and the largest defense contractor in Great Britain, which employs about 88200 people. The company occupies a leading position in the high-tech markets not only of Great Britain, but also of the USA, Australia, Saudi Arabia, South Africa, and Sweden. Every year, the company receives more than a hundred new inventions. 2013, 200 inventions were patented, and 2014 more than 250 inventions were applied for patents. BAE Systems' portfolio of patents and patent applications for inventions worldwide reaches 2000 [30].

According to international patent information databases, only the American defense corporation Raytheon has 12798 patents, of which 5255 are active. About half of these patents were obtained by Raytheon in foreign countries, including 773 in Israel, 138 in China, and 100 in India. In the British defense corporation BAE SYSTEMS, the vast majority of 5445 patents were obtained on the territory of foreign countries, of which 2100 are in the USA, 118 are in India, and 59 are in China [31].

Speaking about the defense sector and its innovativeness, it should be remembered that many innovations developed in this sector do not immediately enter the civilian sector, since technologies often have a dual purpose [32]. Meanwhile, many civilian inventions such as commercial aerospace technology, the Internet, the Global Positioning System (GPS), lasers, digital imaging, microchips, drones, microwave ovens, superglue, duct tape, etc., have their roots in military-sanctioned research. These can be called known spin-off technologies that were originally military/defense. Therefore, it can be argued that many "civilian" technologies in widespread use today are incidental.

In our opinion, the Russian-Ukrainian war, which continues today in Europe, will slow down the cross-sectoral transfer of technologies for a long time due to the possibility of their use in the production of weapons by countries that violate peace and international security.

2.3 National and supranational regulation of technology transfer

Over the past two centuries, states have developed appropriate mechanisms for regulating the interstate transfer of technology. The main ones are:

- direct state regulation of export and import of technology carried out by export control bodies using customs and border control methods
- a system of special government permits for obtaining the right to export one or another technologically intensive product;
- criminal liability for violation of laws regulating the international transfer of technology and protection of intellectual property rights [34, p. 355].

International contractual practice is implemented through various international conventions, agreements, economic and regional unions, intergovernmental bilateral and multilateral agreements on intellectual property and scientific and technical cooperation. Among international organizations working in the field of intellectual property, a special place is occupied by the World Intellectual Property Organization (WIPO) with headquarters in Geneva. WIPO is one of the 16 specialized organizations that are a part of the UN system, and performs the functions of administrative management of multilateral international treaties related to intellectual property [35].

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 Confederation pour la promotion de l'innovation - CTI), the Swiss National Foundation for Scientific Research (FONDS).

The main slogan of KTI is "Science to Market". KTI, as a state-level technology and innovation agency, promotes applied research and development, entrepreneurship development in the field of innovation, and promotion of companies engaged in innovative business. It should be noted that a great deal of credit goes to the private sector in financing scientific and technological developments.

SWIITT was established in 2003 the main function performed by the organization is the exchange of scientific and technological information between public research organizations and the private sector.

CTI activities are aimed at helping researchers at the stage of commercialization of the results of their developments. The Agency provides support to projects with the participation of researchers from universities and representatives of enterprises, while at least half of the costs are borne by economic partners.

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 [36, p. 81].

Sweden. The modern model of the innovative sphere development is based on the concept of the "Triple Spiral", which. It relies on the interaction of its three participants (state, science and business) at all levels: regional (or branch), national, integral. This approach contributes to the effective development of regional innovation systems, sectoral and inter-sectoral interaction of different regions of Sweden, which positively affects the level and quality of life of the population, leads to the improvement of the ecological situation, growth of employment, etc. Therefore, the goals of regional and national development are directly interrelated and their achievement is carried out with the participation of three key links.

The main share of research and development, which is carried out with the financial participation of the state, is carried out in universities and other higher educational institutions in Sweden. Currently, the Swedish government allocates the following priority areas for research and development funding:

- biology, medicine, biotechnology;
- information and telecommunication technologies;
- ecology, climate control, sustainable development.

The support of fundamental research in these areas is carried out by the Swedish Science Council, within the framework of which three more operate: councils for the humanities and social sciences, natural and engineering sciences, and medicine.

Financial support for research and development, in addition to the National Science Council, is also provided by various research funds, the main purpose of which is the implementation of interaction between universities and the business sector. Among the largest research foundations, the Swedish Foundation for

Strategic Research (SSF), Foundation for Strategic Environmental Research (MISTRA), Knowledge Foundation (KKS), Swedish Foundation for Health Care Sciences and Allergy Research (VARDIL) can be singled out.

Various ministerial agencies also operate in Sweden, the activities of which are aimed at financing and supporting the commercialization of research and development results: Agency for Innovation Systems (Vinnova), Technology Transfer Funds (Teknikbrostiftelser), Agency for Energy (STEM), Agency for Economic and Regional Development (NUTEK), network -Group.

Sweden also implements a number of government programs aimed at increasing interaction between the state, science and business. Among such programs, it is possible to single out funding programs of the Swedish Network for Innovation and Technology Transfer Support, incubators within technology transfer offices (Technology Transfer Offices) and Research Centers of Excellence at universities. The main purpose of their activity is to support long-term relations between the academic environment, business and the state in the field of innovation, scientific research and development [38].

United Kingdom. Consortia (clubs) of industrial companies, universities, and research laboratories for joint research and development played a major role in the formation of the technology transfer system in Great Britain. The main tasks of such consortia are to establish relationships between the participants of the innovation process, as well as to spread information about new promising technologies.

A special place in the technology transfer system is occupied by intermediaries between sellers and buyers of new developments - so-called technology brokers. The largest is British Technology Group (BTG), created in 1981. The key task of BTG is to facilitate the transfer of new ideas, knowledge, results of research, developments from universities, polytechnics, scientific research institutions to industrial enterprises through the sale of licenses. In addition, BTG is engaged in the examination of the commercial significance of the proposals of researchers and scientists, the protection of foreign intellectual property in Great Britain, patents the inventions of British scientists abroad, and finances positively evaluated innovative projects.

Defense Technology Enterprises (DTE) deserves special attention when considering the transfer system in United Kingdom. It was created by the joint efforts of the state and a consortium of organizations representing venture capital investors and technology brokers. The purpose of the creation was the need to organize an effective system of transfer of new developments to industry, made as part of the implementation of the programs of the Ministry of Defense of Great Britain. The activity of DTE was carried out according to the principle of a consortium or association, which included several hundred industrial enterprises interested in receiving the results of research and development by scientists of the Ministry of Defense. DTE was also engaged in consulting, expertise of new projects, sale of licenses, provision of venture capital to small enterprises [39].

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. The leading position here is occupied by the Fraunhofer Society, which we have already written about earlier. The main task of the Society's research institutes is to promote the implementation of new technologies in industry, as well as to carry out research of national importance (for example, energy saving, environmental protection, etc.).

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). It should be noted that the formation of effective interaction between the participants of the innovation-technological process through the mediation of the Fraunhofer Society ensures a constant influx and exchange of new knowledge, ideas, technologies, specialists, promotes the establishment of long-term relationships between universities, scientific communities, and industrial enterprises.

Local authorities in Germany also contribute to the organization of the process of transfer of new technologies. Thus, the governments of individual lands contribute to the formation and development of scientific and technological parks, innovation and scientific and educational centers, I regulate this activity as a key factor in the economic development of the region and the country.

USA. technology transfer is the main mechanism of effective use of the results of scientific and technical research and development of the United States, representing a mutually beneficial exchange of knowledge and technologies between the state, science, the field of education and business. Recognition of the technology transfer system as the most important factor in economic growth is enshrined in the US legislation, which defines both administrative, financial and other responsibilities of participants in innovative activities in the process of creating and implementing innovations and technologies. Thus, the first federal law regulating the transfer of technology (Bayh-Dole Act), adopted in 1980, gave universities, as well as non-profit small businesses, the right to transfer licenses to industrial companies for the commercial use of the results of research and development obtained with the financial support of the government .

In the same year, a law (Stevenson-Wydler Act) was adopted, aimed at strengthening the interaction of federal laboratories with industrial enterprises, public and private sectors. The next stage in the formation of a regulatory framework for the interaction of participants in the innovation process was the Small Business Innovation Development Act, adopted in 1982, on the basis of which a special Small Business Innovation Research (SBIR) program was adopted, which obliges federal agencies with an annual research and development budget of more than 100 million dollars. allocate at least 1,25 % of this budget for their implementation by small businesses. As a result, since the upper limit of allocations was not established, it turned out to be higher in some ministries.

Adopted in 1984, the National Cooperative Research Act lowered antitrust barriers for conducting joint research with the participation of both government structures and industrial enterprises, private businesses, and universities. This has contributed to the creation of several hundred research and development consortia.

1986 the Federal Technology Transfer Act was adopted, according to which various institutional structures (universities, private and state laboratories, companies, consortia, state structures) were given the right to enter into various agreements on joint research and development. The law also defined restrictions related to commercial, state secrets, national security.

The creation of centers for the transfer of industrial technologies to ensure closer cooperation between the public and private sectors of the economy was established by the Omnibus Trade and Competitiveness Act) in 1988.

The provisions of the latter two regulations were expanded by the National Competitiveness Technology Transfer Act of 1989. The Act authorized federal laboratories under contractual obligations with federal agencies to enter into other arrangements with third parties, both public and private.

In the course of conducting a consistent state policy, the effectiveness of technological exchange was recognized, which benefits both the state (to solve the strategic tasks of the national economy) and the private sector, giving the opportunity to increase the profits of firms and corporations, to increase their level of competitiveness on the world markets of high-tech products.

Based on the results obtained, the US government in the early 1990s formed the National Technology Transfer Network, consisting of a central National Technology Transfer Center (NTTC) and six regional Technology Transfer Centers (RTTCs) located in different regions of the country. In addition to those considered in the USA, there are also a number of technology transfer programs implemented by the country's ministries and agencies. These include programs of the National Science Foundation, the National Space Agency, programs of the Ministry of Defense, the Ministry of Energy, the Ministry of Agriculture, and others.

Thus, an extensive institutional network has been created in the USA, each member of which has different needs and capabilities, and whose activities are aimed at achieving effective interaction of the state, science and business in the process of creating and using knowledge and technologies in order to ensure general economic growth [40].

China. The formation of the integration of the state, science, education and business structures in China was preceded by the reforms of the 1970s and 1980s and the national development programs adopted on their basis. In March 1986, the state program for the development of science and high technologies "Program 863" was approved, which identified such priority areas as microelectronics, computer science, space, optical fiber technologies, genetic engineering and biotechnology, energy-saving technologies and medicine.

The program provided for conducting both fundamental and applied research, development of new technologies taking into account the development of traditional industries. The implementation of this program turned out to be quite effective. So, literally in the first 10 years of its operation, more than a thousand of the most important scientific and technical achievements were registered, of which 560 developments received world recognition, 73 were awarded state prizes, and 266 were patented abroad.

After two years, China started the implementation of the "Torch" research and production program, aimed at the commercialization and industrialization of science-intensive technologies.

1988, by a decree of the State Council of China, the first technology park was founded, the Beijing High-Tech Experimental Zone (later renamed Zhongguancun Science and Technology Zone or Z-park for short).

Z-park was not accidentally located in the northwest of Beijing. It is here that more than a hundred scientific and technical institutes and laboratories are located, as well as the strongest universities in China - Peking University and Tsinghua University. It was they who became the main elements of the technopark: the universities provided both scientific developments, companies promoting them, and qualified personnel for high-tech business.

It should be noted that the integration component in China has a territorial organization, the basis of which is the division into new and high technology development zones formed in the mid-1980s, which are science and technology parks.

Currently, 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.

It should be noted that the state policy of China is aimed at all kinds of support for new and high-tech enterprises, technology park structures, effective development of the country's economy, which is oriented towards its own scientific and technical potential. Thus, according to the national program adopted in 2006, state bodies are obliged to allocate a certain share of their costs to the products of innovative Chinese companies only (regardless of the profitability of such purchases). According to the new rules, government agencies can purchase foreign products only if there is no alternative in China [41].

So, summarizing the consideration of issues of modern trends in the global technology market, we can draw the following conclusions.

1. 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 favor 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.

2. The resulting indicator of the effective involvement of the latest technologies in production can be considered absolute or relative volumes of export of high-tech products. According to the absolute indicator, the leadership in the world is held by the Chinese economy, for which a regression model was built in order to determine the relevant factors of technological production. The main factors behind China's success in this field were the influx of foreign direct investment, the number of non-resident patent applications and the number of articles in scientific and technical journals.

3. Among the primary subjects of the global technology market, global companies occupy a particularly active position. We analyzed the features of technology trade by three groups of companies - giants of the digital industry (Microsoft, Google, Amazon), biopharmaceutical companies (Pfizer, Jonson&Jonson, Roche) and defense industrial enterprises (BAE System, Raytheon). It was noted that in the conditions of the Russian-Ukrainian war and geopolitical instability, it is possible to artificially slow down the transfer of dual-use technologies from the defense-industrial to the civilian sector, as well as from developed countries to developing ones.

4. The system of international and national regulation of technology transfer has the character of streamlining and all kinds of assistance to this process. The supranational institutional field of technology transfer is formed by acts of the UN Trade and Development Commission, the Organization for Economic Cooperation and Development, and the World Intellectual Property Organization. As foreign experience shows, innovation-oriented countries have extensive legislation capable of stimulating the involvement of advanced technologies in the economy.

3 ACCELERATION OF INTERNATIONAL TECHNOLOGICAL EXCHANGE IN UKRAINE AS A MEANS OF INNOVATIVE ECONOMIC DEVELOPMENT

3.1 Problems of technology transfer development in Ukraine

One of the main problems inherent in the modern economy of Ukraine is the search for ways to activate technological changes in the domestic economy. In this context, much attention should be paid to technology transfer processes, which are seen as a chance for successful competition with countries with higher technological potential.

At the same time, it should be clearly understood that the involvement of foreign technologies in this case is not an end in itself, but only a potential tool for increasing the overall technological level and the level of production productivity, which will form the basis for sustainable and stable economic growth.

The lack of an effective national system of international technology transfer in Ukraine and the inconsistency of legal acts with international requirements for the protection of intellectual property rights are among the important factors that determine the low efficiency of innovative activities of domestic enterprises and significantly affect the level of international competitiveness of the national economy. 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 [42, p. 13].

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 [43].

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 [44]. 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. 3.1, 3.2).

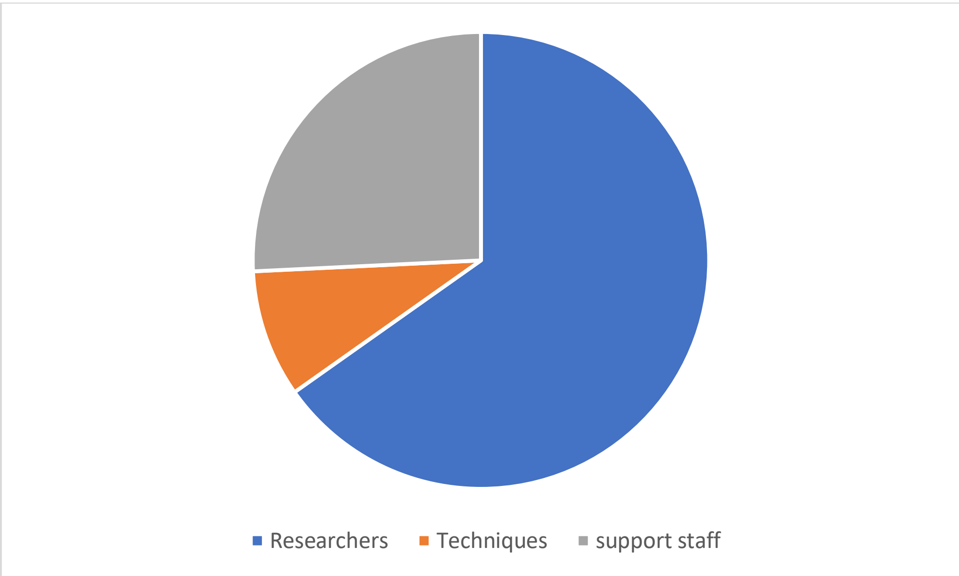

Figure 3.1 - Structure of R&D personnel by occupation for 2020

Source: Кількість працівників, задіяних у виконанні наукових досліджень і розробок за категоріями персоналу (2010-2020): Державна служба статистики України.

https://ukrstat.gov.ua/operativ/operativ2021/ni/rik/kpzvndrkp_10_20_ue.xlsx

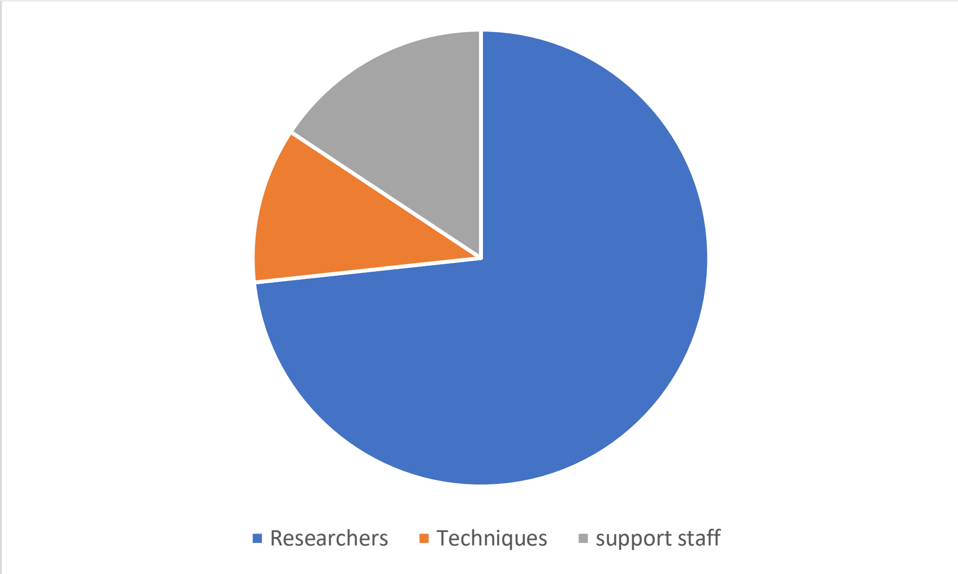

Figure 3.2 - Structure of R&D personnel by occupation for 2010

Source: Кількість працівників, задіяних у виконанні наукових досліджень і розробок за категоріями персоналу (2010-2020): Державна служба статистики України.
https://ukrstat.gov.ua/operativ/operativ2021/ni/rik/kpzvndrkp_10_20_ue.xlsx

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 3.1). 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. Despite the fact that the share of industrial enterprises implementing innovations has hardly changed over the studied period, their absolute number has decreased due to the reduction of the total number of industrial enterprises. Moreover, you should pay attention to the indicator "Products, new for the market" given in the table 3.1. In the last decade, the number of such products has increased dramatically - from 4 units in 2005 to 606 units in 2010. However, this is not a breakthrough for our industrial enterprises. This is explained by a change in the method of calculating this indicator. A product is considered new to the market when the enterprise that introduced the innovation is the first to bring it to its market.

Table 3.1 - Implementation of innovations at industrial enterprises of Ukraine [45]

	2000	2005	2010	2015	2020
Share of the number of industrial enterprises implementin 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

Under its market, to which the enterprise brings out the product, is understood the perception of the enterprise itself about the market where it operates, and which may consist of this enterprise together with its competitors, perhaps taking into account the geographical aspect or a typical series of products. The minimum level of novelty to include any change in the "innovation" category is defined as new for the enterprise. The product can already be used at other enterprises, but if it is new or significantly improved for this enterprise, then such a change is considered as an innovation for it.

Thus, Ukrainian companies show a tendency to reduce generation and use of their own innovations in the production process. Therefore, there is a logical need to attract new technologies through their transfer from abroad. Therefore, the volumes of licensing and patenting services that Ukraine imports from abroad are increasing year by year (Fig. 3.3, 3.4).

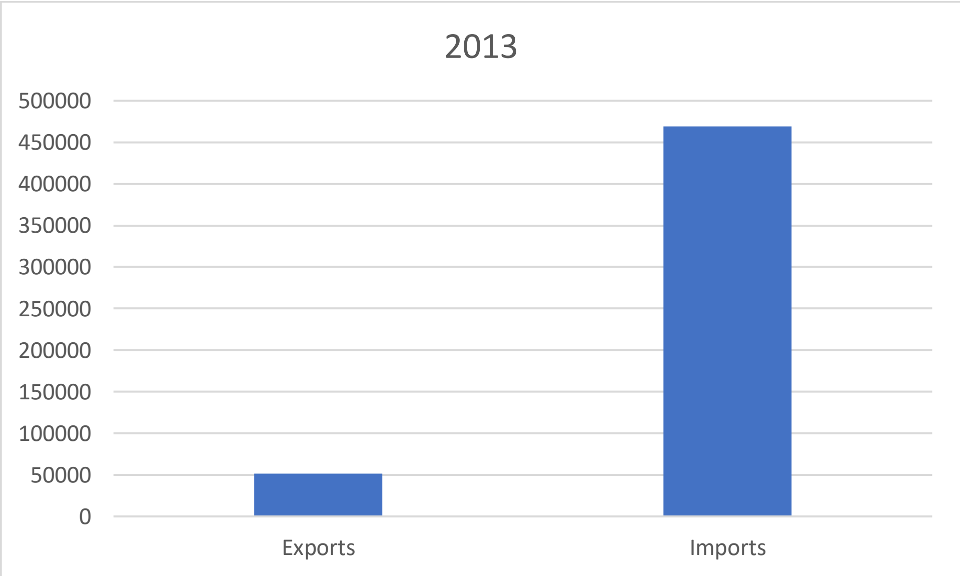

Figure 3.3 - Licensing services trade of Ukraine 2013-2020, thsd. USD

Source: Dynamics of foreign trade by types of services. https://ukrstat.gov.ua/operativ/operativ2008/zd/dseip/dseip2021_ue.xls

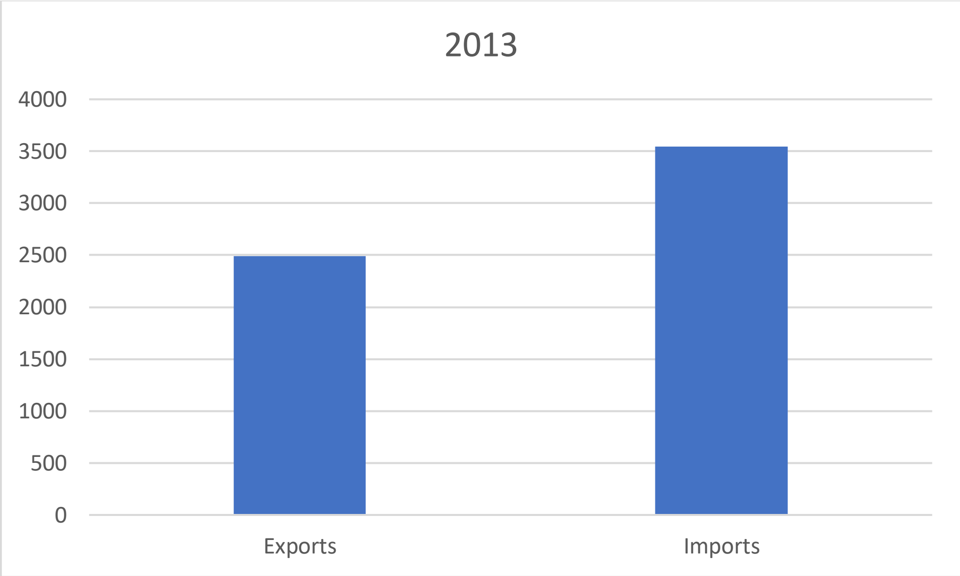

Figure 3.4 - Trade of Services for patent activities 2013-2020, thsd. USD

Source: Dynamics of foreign trade by types of services. https://ukrstat.gov.ua/operativ/operativ2008/zd/dseip/dseip2021_ue.xls

The significant excess of import of licensing services over import demonstrates the growing dependence of Ukrainian companies on international technology transfer in the form of licenses. During the entire period of 2013-2021, the volume of imports fluctuated in the range of 469 million dollars In 2013, up to 150 million dollars In 2016 (see Fig. 3.3). On the other hand, the volume of export of license services varied within much more modest limits - from 68,7 million dollars In 2014, up to 14,1 million dollars In 2017.

The situation with foreign trade in services related to patenting is not so clear-cut (see Fig. 3.4). Here, throughout the studied period, positive balances of the ratio of export and import alternated with negative ones, which is explained by the sporadic process of preparing applications for patents.

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. Any technology that comes from outside to the enterprise can be considered as innovative, although it can be quite common in the world, i.e. traditional. The fundamental difference between the transfer of traditional and innovative technology concerns exclusively the mechanism of its implementation. 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 [46, p. 40]. In addition, the cost of the existing technology, due to its certain distribution in the global technological market, will be an order of magnitude lower.

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). However, the absence of patent rights means the possibility for others to use the same know-how that they will arrive at independently through re-engineering (reverse engineering), which will lead to the loss of the know-how regime. In Ukraine, the issues of protection of official confidential information, commercial secrets, in particular, "know-how" are still not regulated by law. 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) [31].

The reduction of patenting of technical solutions obtained by Ukrainian developers leads to an increase in the number of patents issued in Ukraine to foreign applicants, which, in turn, requires funds to purchase licenses from them. It is worth realizing that due to the territorial nature of patent law, a patent performs its functions only within the borders of the state that issued it. This is due to the legal necessity of patenting inventions in foreign countries in order to establish their legal protection. The most important goal of patenting inventions in foreign countries is to ensure the export of industrial products in the country of patenting, to create conditions for unhindered export of goods. Merchandise export is usually preceded by the patenting of inventions. Protection of direct commercial exports remains the main form of use of patents obtained abroad. Patenting abroad is also carried out for the purpose of using foreign rights as an independent object of commercial operations in foreign trade. Obtaining a foreign patent is the basis for selling patented inventions and, more importantly, concluding license agreements for their use [47].

The scale of technology export is significant, and in terms of growth rates, the global volume of license trade is significantly ahead of the volume of commodity export-import transactions. This is due to many economic and legal reasons. They include:

- impossibility for patent owners to make large capital investments abroad to organize independent production based on patented inventions;
- unprofitability or impossibility of commodity export to any country (due to the formed level of prices set for imports, high customs tariffs, currency restrictions, etc.).

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 [48, p. 12]. On the other hand, in Ukraine, unlike European and many post-Soviet countries, there is no state support for foreign patenting.

3.2 Prospects for the development of technological exchange in Ukraine

Possessing foreign patents, companies not only trade them, but also create international patent associations - cartels, pools, etc., which now play an important role in the world economy, connecting powerful corporations of the most developed countries. The legal basis of such purely monopolistic associations are agreements on the exchange of patents, licenses and technical documentation for the purpose of joint use of inventions. Often, the agreements provide for the creation of new enterprises that transfer patents for their joint use under licenses and the division of income according to established shares. Participants of patent cartels, not limited to the exchange of rights to use inventions, establish the specialization and distribution of production programs, quotas for the production of goods, their distribution areas by country, determine prices and all technological policies in the leading branches of the economy. Note that the patent activity of foreign companies is also aimed at patent blocking, first of all, promising Ukrainian scientific and technical developments. Such are the features of the modern competitive struggle of large companies on the global commodity markets [49, p. 13].

Fourthly, Ukraine has so far failed to create a competitive environment and significantly increase the innovative motivation of business entities, optimally using limited financial resources for scientific and technological modernization of the economy. This not only discredits the existing national innovation potential, but also contradicts the national economic interests of Ukraine, which has prerequisites for increasing the creative segment of the economy. In the context of the problem of competitiveness in global conditions, Ukraine needs, on the one hand, the use of foreign experience in the implementation of a modern strategy of national economic development, and on the other hand, the implementation of a systemic innovation policy with the definition of the goals, motivations and priorities of the creative economy at the state level [46, p. 40].

The formation of an effective innovation system and the implementation of a cluster approach, which provide effective means and tools for stimulating effective development, the concentration of financial resources is relevant for the domestic economy, which has a significant potential for the modernization of traditional and the development of the latest technologies [49, p. 16].

Fifth, a flexible organizational and institutional environment for innovative activity should be formed in Ukraine, which provides for:

- creation of a network of innovative financial institutes and technology transfer centers;
- development of the infrastructure of the innovation sphere, creation and development of information and consulting agencies with the active participation of the state;
- improvement of the system of forecasting, strategic and operational monitoring of innovative development, effective response to dynamic fluctuations in the conjuncture of domestic and foreign markets;
- implementation of the latest information technologies and means of communication for high-speed transmission of information in the subsystems of the national innovation system;
- realization of the potential of multi-speed European regional scientific and technological integration, taking into account the factors of global influence [50, p. 26].

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. Ukraine has applied to join the EU, which means that the sectoral rapprochement of the national and European economies will require the creation of prerequisites for the integration of the scientific and technological sector on European institutional foundations.

Therefore, the acceleration of the international technological exchange of Ukrainian companies with foreign partners in order to increase their level of innovation is based on the following features of the national and international environment of scientific and technological activity.

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. The analysis of factual material indicates a steady reduction of the scientific and technological potential of the Ukrainian economy and, as a result, a decrease in the competitiveness of domestic production.

3. 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.

4. After the end of Russian-Ukrainian war, it seems expedient for us 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.

1. Technology transfer is a process by which commercial technology spreads in modern conditions. It is a set of actions, some of which can be described by separate agreements, while others are not reflected in contractual forms. The object of the transfer process is technology as a set of knowledge and methods for creating a material object or organizing certain actions. The qualitative characteristic of technology is the level of its scientific content. International technology transfer is a process of cross-border transfer/diffusion of ownership rights to knowledge by organizing activities aimed at creating an innovative product, which occurs with active interaction of its subjects on a paid or free basis.

2. Ready goods, as well as factors of production (labor, capital, land) can be carriers of technologies. 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). The channels through which technology is transferred are divided into commercial and non-commercial. The main methods of technology transfer on a commercial basis are leasing, franchising (commercial concession) and license agreement.

3. In their technology transfer activities, international companies are guided by such types of technological policy as "center-for-global", "local-for-local", "locally-leveraged", "globally-linked".

4. 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 favor 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.

5. The resulting indicator of the effective involvement of the latest technologies in production can be considered absolute or relative volumes of export of high-tech products. According to the absolute indicator, the leadership in the world is held by the Chinese economy, for which a regression model was built in order to determine the relevant factors of technological production. The main factors behind China's success in this field were the influx of foreign direct investment, the number of non-resident patent applications and the number of articles in scientific and technical journals.

6. Global companies occupy a particularly active position among the primary subjects of the global technology market. We analyzed the features of technology trade by three groups of companies - giants of the digital industry (Microsoft, Google, Amazon), biopharmaceutical companies (Pfizer, Jonson&Jonson, Roche) and defense industrial enterprises (BAE System, Raytheon). It was noted that in the conditions of the Russian-Ukrainian war and geopolitical instability, it is possible to artificially slow down the transfer of dual-use technologies from the defense-industrial to the civilian sector, as well as from developed countries to developing ones.

7. The system of international and national regulation of technology transfer has the character of streamlining and all kinds of assistance to this process. The supranational institutional field of technology transfer is formed by acts of the UN Trade and Development Commission, the Organization for Economic Cooperation and Development, and the World Intellectual Property Organization. As foreign experience shows, innovation-oriented countries have extensive legislation capable of stimulating the involvement of advanced technologies in the economy.

8. 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.

9. The analysis of the factual material indicates a steady reduction of the scientific and technological potential of the Ukrainian economy and, as a result, a decrease in the competitiveness of domestic production.

10. 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.

11. After the end of Russian-Ukrainian war, it seems expedient for us 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.

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ANNEXES

Annex A.

Summary

Siedieliev S. G. Technology transfer in the work of international companies. – Masters-level Qualification Thesis. Sumy State University, Sumy, 2022.

The work examines the content, forms and mechanisms of technology transfer carried out by international companies. The current state of the global technology market is analyzed and its main trends are revealed. A system of measures for the transition of Ukrainian companies to innovative type of development based on the international technology transfer activation is proposed.

Keywords: technology, technology transfer, patent, license, know-how, international company, high-tech export, global technology market

Анотація

Сєдєлєв С. Г. Трансфер технологій в роботі міжнародних компаній. - Кваліфікаційна магістерська робота. Сумський державний університет, Суми, 2022 р.

У роботі проведене дослідження змісту, форм та механізмів трансферу технологій, який здійснюють міжнародні компанії. Проаналізований сучасний стан світового ринку технологій та виявлено його основні тенденції. Запропоновано систему заходів на перехід українських компаній до інноваційного типу розвитку на основі активізації міжнародного трансферу технологій.

Ключові слова: технологія, трансфер технологій, патент, ліцензія, ноу-хау, міжнародна компанія, експорт високих технологій, світовий ринок технолог

Annex B

Table B.1 - Indicators of the scientific and technical sphere of China in 2007-2020, used in the construction of the regression model *

Years	High-technology exports (current US$) ($Y$)	Foreign direct investment, net inflows (BoP, current US$) ($X_1$)	Industrial design applications, nonresident, by count (X_2)	Patent applications, nonresidents (X_3)	Scientific and technical journal articles (X_4)	Technical cooperation grants (BoP, current US$) ($X_5$)
2007	3,43E+11	1,56249E+11	13993	92101	165335,65	948260000
2008	3,91E+11	1,71535E+11	14284	95259	189949,47	969550000
2009	3,59E+11	1,31057E+11	11688	85508	215206,94	929540000
2010	4,74E+11	2,43703E+11	12149	98111	249048,56	959150000
2011	5,4E+11	2,80072E+11	13930	110583	286371,91	834350000
2012	5,94E+11	2,41214E+11	15181	117464	312516,81	678710000
2013	6,56E+11	2,90928E+11	15165	120200	326770,84	557750000
2014	6,54E+11	2,68097E+11	16127	127042	329015,38	552470000
2015	6,52E+11	2,42489E+11	17578	133612	359274,07	476440000
2016	5,95E+11	1,7475E+11	18395	133522	390396,24	478550000
2017	6,54E+11	1,66084E+11	17841	135885	407974,61	504420000
2018	7,31E+11	2,35365E+11	19702	148187	438348,74	515520000
2019	7,15E+11	1,8717E+11	19846	157093	473438,51	562390000
2020	7,57E+11	2,53096E+11	18023	152342	528263,25	572820000

* Source: World development indicators. Worldbank. https://databank.worldbank.org/data/download/WDI_excel.zip\

Table B.2 – Patent applications by region, 2011 and 2021 *

Region	Number of applications		Resident share (%)		Share of world total (%)		Average growth (%)
	2011	2021	2011	2021	2011	2021	2011–2021
Africa	14 700	20 900	15,0	22,0	0,7	0,6	3,6
Asia	1 178 800	2 299 600	74,9	82,7	54,6	67,6	6,9
Europe	334 100	357 900	64,8	56,2	15,5	10,5	0,7
Latin America and the Caribbean	60 100	54 800	12,1	13,7	2,8	1,6	–0.9
North America	538 700	628 600	46,9	42,5	25,0	18,5	1,6
Oceania	31 800	39 300	12,3	8,4	1,5	1,2	2,1
World	2 158 200	3 401 100	63,3	70,1	100,0	100,0	4,7

* Source: WIPO Statistics Database, September 2022.

Table B.3 - Trend in patent applications for the top five offices, 1883–2021 *

Year	China	US	Japan	Rep. Korea	EPO
1	2	3	4	5	6
2021	1 585 663	591 473	289 200	237 998	188 778
2020	1 497 159	597 172	288 472	226 759	180 346
2019	1 400 661	621 453	307 969	218 975	181 479
2018	1 542 002	597 141	313 567	209 992	174 397
2017	1 381 594	606 956	318 481	204 775	166 585
2016	1 338 503	605 571	318 381	208 830	159 358
2015	1 101 864	589 410	318 721	213 694	160 028
2014	928 177	578 802	325 989	210 292	152 662
2013	825 136	571 612	328 436	204 589	147 987
2012	652 777	542 815	342 796	188 915	148 560
2011	526 412	503 582	342 610	178 924	142 793
2010	391 177	490 226	344 598	170 101	150 961
2009	314 604	456 106	348 596	163 523	134 580
2008	289 838	456 321	391 002	170 632	146 150
2007	245 161	456 154	396 291	172 469	140 763
2006	210 501	425 966	408 674	166 189	135 231
2005	173 327	390 733	427 078	160 921	128 713
2004	130 384	356 943	423 081	140 115	123 701
2003	105 317	342 441	413 093	118 651	116 604
2002	80 232	334 445	421 044	106 136	106 243
2001	63 450	326 471	439 175	104 612	110 027
2000	51 906	295 895	419 543	102 010	100 692
1999	50 044	265 763	404 457	80 642	89 359
1998	47 396	236 979	402 095	75 233	82 087
1997	24 774	220 496	401 618	92 684	72 904
1996	22 742	211 946	376 674	90 326	64 035
1995	18 699	228 142	368 831	78 499	60 559
1994	19 067	202 755	341 201	45 712	57 842
1993	19 618	184 196	355 500	36 493	56 974
1992	14 409	183 347	362 197	31 073	58 896
1991	11 423	172 115	361 590	28 133	55 984
1990	10 137	171 163	360 704	25 820	60 754
1989	9 659	158 707	345 140	23 315	55 774
1988		143 836	335 759	20 051	49 774
1987	8 059	131 837	336 884	17 057	45 069
1986	8 009	120 916	316 162	12 755	41 342
1985	8 558	115 235	299 851	10 585	36 916
1984		111 284	282 314	8 633	35 982
1983		103 703	252 685	6 394	30 664
1982		109 625	237 513	5 924	27 422
1981		106 413	218 261	5 303	24 119
1980		104 329	191 020	5 070	18 596

Continuation of table B.3

1	2	3	4	5	6
1979		100 494	174 569	4 722	11 284
1978		100 916	166 092	4 015	3 598
1977		100 931	161 006	3 139	
1976		102 344	161 016	3 261	
1975		101 014	159 821	2 914	
1974		102 538	149 319	4 455	
1973		104 079	144 814	2 398	
1972		99 298	130 400	1 995	
1971		104 729	105 785	1 906	
1970		103 175	130 831	1 846	
1969		101 415	105 586	1 701	
1968		93 471	96 710	1 463	
1967		88 164	85 364		
1966		88 525	86 046	1 060	
1965		94 629	81 923	1 177	
1964		87 592	74 980		
1963		85 869	71 790	2 558	
1962		85 180	60 127		
1961		83 396	48 417		
1960		79 721	43 484		
1959		78 708	41 537		
1958		77 629	38 518		
1957		74 298	33 188		
1956		75 211	33 245		
1955		77 502	34 508		
1954		77 503	29 369		
1953		74 036	24 575		
1952		63 391	20 877		
1951		60 670	17 764		
1950		67 556	16 896		
1949		67 811	14 266		
1948		68 903	11 582		
1947		75 669	9 260		
1946		81 274	8 136		
1945		68 052	4 258		
1944		54 409	12 578		
1943		44 774	17 108		
1942		44 984	16 359		
1941		52 050	19 997		
1940		60 836	19 827		
1939		64 182	18 349		
1938		66 851	18 211		
1937		65 416	17 381		

Continuation of table B.3

1	2	3	4	5	6
1936		62 740	18 511		
1935		58 344	16 645		
1934		56 882	14 722		
1933		56 694	13 904		
1932		67 172	13 878		
1931		79 981	15 183		
1930		89 848	15 430		
1929		89 969	14 296		
1928		87 837	13 059		
1927		87 545	12 607		
1926		80 682	12 495		
1925		80 106	12 680		
1924		77 121	9 894		
1923		76 652	7 969		
1922		84 167	9 886		
1921		87 732	12 026		
1920		82 155	11 017		
1919		76 773	9 883		
1918		57 347	7 383		
1917		67 828	6 483		
1916		68 349	6 383		
1915		67 335	6 359		
1914		67 774	6 490		
1913		68 117	7 359		
1912		69 126	7 168		
1911		67 587	6 205		
1910		63 293	5 964		
1909		64 408	6 210		
1908		60 142	5 393		
1907		57 679	4 754		
1906		55 676	4 509		
1905		54 034	2 897		
1904		51 168	2 618		
1903		49 289	3 253		
1902		48 320	3 095		
1901		44 088	2 397		
1900		39 673	2 006		
1899		38 937	1 515		
1898		33 915	1 789		
1897		45 661	1 542		
1896		42 077	1 213		
1895		39 145	1 122		
1894		36 987	1 250		

Continuation of table B.3

1	2	3	4	5	6
1893		37 293	1 337		
1892		39 514	1 344		
1891		39 418	1 288		
1890		39 884	1 180		
1889		39 607	1 064		
1888		34 713	778		
1887		35 230	906		
1886		35 161	1 384		
1885		34 697	425		
1884		34 192			
1883		34 073			

- Source: WIPO Statistics Database, September 2022.