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03

MODERN ASPECTS

OF HUMAN CAPITAL MANAGEMENT OF INNOVATIVE TECHNOLOGIES IN INDUSTRIAL CLUSTERS

ASPECTOS MODERNOS DE LA GESTIÓN DEL CAPITAL HUMANO DE TECNOLOGÍAS INNOVADORAS EN CLÚSTERES INDUSTRIALES

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ABSTRACT

The objective of this work is to analyze the most relevant aspects of human capital management with innovative technologies in industrial clusters in the modern era. For this, an analysis of the relationship between the development of human capital, innovation and its effective implementation is carried out. in industrial clusters. The role of industrial clusters, their multifunctional activity and the fact that they have favorable conditions for the training of qualified personnel are analyzed. Thus, the potential of industrial clusters to be attractive in terms of investment and play an important role in the development of human capital has been confirmed. In addition, statistics related to economic and structural reforms related to the development of human capital in Azerbaijan are analyzed, which in the opinion of the authors will play a fundamental role for the future development of industrial clusters in the nation. Finally, considering the challenges and opportunities that are presented in the country, recommendations and suggestions were made to achieve progress in this field.

Keywords: Azerbaijan, human capital, industrial clusters, innovation, human capital management.

RESUMEN

El objetivo de este trabajo es analizar los aspectos más relevantes de la gestión del capital humano con tecnologías innovadoras en los clústeres industriales en la era moderna. Para ello se realiza un análisis de la relación del desarrollo del capital humano, la innovación y su implementación efectiva en clústeres industriales. Se analiza el papel de los clústeres industriales, su actividad multifuncional y el hecho de que cuentan con condiciones favorables para la formación de personal calificado. Así, se ha corroborado el potencial de los clústeres industriales para ser atractivos en términos de inversiones y desempeñar un papel importante en el desarrollo del capital humano. Además, se analizan estadísticas relacionadas a las reformas económicas y estructurales relacionadas al desarrollo del capital humano en Azerbaiyán, lo que en opinión de los autores jugará un papel fundamental para el futuro desarrollo de los clústeres industriales en la nación. Finalmente, considerando los retos y oportunidades que se presentan en el país se hicieron recomendaciones y sugerencias para lograr avances en este campo.

Palabras clave: Azerbaiyán, capital humano, clústeres industriales, innovación, gestión de capital humano.

INTRODUCTION

In modern times, improving and diversifying the structure of the country's economy, developing the economy on the basis of innovative technologies is of great importance. In the context of deepening global threats and economic transformations, the development, application, and management of innovative technologies are of great importance. The role and importance of human capital in these processes and the training of high-level professionals, the development of managers and the training of highly intelligent specialists distinguished by their ability to manage these processes are very important conditions (Azarenko et al., 2020).

The application of innovative technologies plays an important role in balancing and developing economic processes at the world level. It is during the last 50 years that the world economy has developed due to new sources of growth with capacity for science and technology, more productivity has been achieved and the cost of manufactured products has been optimized. However, among the main goals in the modern era is the efficient use of existing human capital and the management of this capital, which has significantly increased the role of innovative processes. Of course, for this, various levels of economic mechanisms, multifunctional economic activity areas and spaces are created in the countries of the world. However, among the main goals in the modern era is the efficient use of existing human capital and the management of this capital, which has significantly increased the role of innovative processes.

In the world experience, there are many institutions whose activity creates favorable conditions for the realization of human capital and its more efficient use (Budrin et al., 2020). It is the acceleration of development based on the development of technologies and innovation, the application of mechanisms that reflect modern innovations in terms of economic and other parameters, the formation of activities based on knowledge and intelligence, which once again brings the importance of human capital to the fore in the modern era and conditions its management with innovative technologies. The main goal here is to increase the role of innovative technologies in the efficient use of resources in the country, the development of new innovations and the maximum efficient organization and support of innovation activities attract more attention.

On the other hand, in order to make the activity of industrial sectors and business structures operating in the country more efficient and attractive, to develop high technologies in terms of improving the investment environment, to form economic sectors based on innovative technologies, to take additional measures to expand innovation entrepreneurship and create innovation enterprises, to increase interest in innovation products increasing, the innovation system is one of the important conditions (Samuelson & Nordhaus, 2010). It is precisely in the United States and China, which are currently at the forefront of the world economy where hundreds of billions of dollars are spent on the development of technologies and innovations. The main purpose of these spent funds is the development of new technologies, the effective use of the potential of the human factor, human index, and human capital in these processes, the mobilization of intellectual resources and increasing their role in the development of real economic sectors, expanding their participation in the processes of creating added value (Balog & Demidova, 2021).

At the same time, the role of human capital, its effective use and management is the basis of the technological breakthrough in many countries worldwide. Also, many economic mechanisms, including special economic zones, industrial parks, technological parks, and also industrial clusters perform important functions. Development of industrial clusters and creation of promising and productive, as well as science and high-tech economic sectors on the basis of industrial clusters is very efficient (Becker, 1994).

It should be noted that the concept of "cluster" was formulated by American economist Michael Porter in 1990. A cluster is a collective group of participating entities that are geographically separated by their neighborhood and that interact with each other, are characterized on the basis of common principles of activity and complement each other (Porter, 1998).Cluster participants operate locally in a geographically specific area and are distinguished by general similar characteristics in terms of resource, technological product production. In addition to these characteristics of clusters, their directions of activity are also formed in terms of development and production of innovative products.

In terms of evaluating each technologically innovative product, industrial clusters stand out as both a multifunctional activity space and a technological entity capable of flexible and quick response. Also, careful examination of the proposed issues and the formation of one's action strategy accordingly, taking necessary steps, objectively conducting expertise and evaluation of investment projects, taking responsibility for given forecasts and other such important issues should be systematically reviewed and evaluated. There are opportunities for modeling the efficient use of human resources in industrial clusters, organizing the management of human capital with innovative

technologies, and implementing voluntary measures related to them, etc.

The multifunctional characteristics of industrial clusters can play an important role in the productive use of human capital due to its development, the mobilization of related resources, and the development of innovative technologies. But for this, first of all, it is necessary to look at very important aspects of the use of human capital in the country (Kakava & Unanov, 2017). Human capital was still highly valued in the approaches of the founders of the classical economic school, and special attention was paid to human labor, flexibility and skill of the worker. Adam Smith noted that the growth of useful work production depends, first of all, on the improvement of the flexibility and skill of the worker, and then on the improvement of the machines and tools he uses (Smith, 2019).

That is, the main resources consist of machines and other tools, buildings, land and acquired useful skills of the population and members of society. As you can see, if we approach it from this perspective in the modern era, if we add high technologies, innovative approaches and innovation functions to the human factor, we can imagine how much power and productivity human capital has. From this point of view, it should be noted that in the modern era, the improvement of human skills, human quality and its level of professionalism, continuous strengthening of state policy in this direction, directing intellectual resources to real economic areas and taking related measures can enable the harmonious development of society and the state together. At the same time, in this direction, it is necessary to widely use the possibilities of "public-private sector" cooperation.

In the conditions of global challenges, the development of industrial clusters, the formation of highly qualified personnel in residents operating here, the formation of an engineering and management yard, and the development of human capital in general, and the effective management of this capital, are important conditions. That is, in the processes of developing and managing innovative technologies, the current attractive conditions enabled and created by industrial clusters play an important role in the sufficient use of human capital opportunities (Feser, 1998). Then, the objective of this work is to analyze the most relevant aspects of human capital management with innovative technologies in industrial clusters in the modern era.

DEVELOPMENT

Literature review on human capital and innovation

Revealing human potential and objectively evaluating the human factor in the processes of high-tech development requires a revision of conceptual approaches in modern times. Thus, economic growth creates conditions for the development of human potential, especially for raising the level of education of the country's population. In addition, education in itself is an important condition for economic growth and formation of national wealth. Economists have believed for a long time that the main part of the economic resources of any country is physical capital, material wealth but a 1995 World Bank study of 192 countries found that physical capital accounted for only 16% of total wealth, with education and human capital accounting for 64% of total wealth. And in high-income economies such as Japan and Switzerland, up to 80% of total capital consists of human capital.

In terms of the concept of human development, education of a person plays an important role in expansion. So high quality education and professional training that meets the demands of the labor market, worthy of people employment, realizing one's full potential, provides an opportunity to increase productivity. In modernizing societies, knowledge and skills are considered capital and the economy becomes the main resource. A society dominated by intellectual workers it makes new demands on people's social activity and social responsibility and thus the concept of "educated person" takes on a new meaning. This way education is important for the human development of every country and the future of the state. We are already living in such a rapidly changing era that the steps taken in the field of education should be based not on modern requirements, but on future perspectives and it should be focused on quality, not quantity (Scientific Research Institute of Economic Reforms, 2017).

In general, issues related to the impact of education on long-term development should be constantly monitored during the formation, management and adaptation of education policy to changing conditions. We already understand that with the help of innovation education, we nurture the formation of innovation thinking. In this regard, it is necessary to direct the process of teaching people to the creation of pedagogical innovation that ensures the development of professional competence. Fulfillment of this task requires the following: 1) providing spiritual and

moral education; 2) formation of professional competence; 3) the ability to create innovation; 4) development of innovation culture; 5) motivation of active innovation activity and 6) formation of business acumen and ability to engage in business.

Human capital is one of the most important elements of the country's national wealth, with its help, the innovation economy carries out reproduction (Jotabá et al., 2022). Human capital is also an intensive factor in the development of society and economy. Here, it is appropriate to give brief information about reproduction capital, intellectual capital and innovation competence (Lenihan et al., 2019). The formation of the innovation economy has led to the emergence of new characteristics of human capital and its response to new requirements. Therefore, first of all, it is appropriate to mention information about the subject, main tasks and functions of innovation economy as a science.

Innovation economy is a new field of science that includes the creation of high technologies, equipment, and management systems invented by innovators, training of personnel capable of solving problems facing society. The subject of the innovation economy is the innovation process, which includes various stages of innovation activity, which is related to the creation, application and distribution of the innovation product. These ensure the formation of a new technological system.

The above-mentioned generally requires the improvement of the innovation activity of human capital, which is the main participant of the innovation economy. The requirements for a person to work in the conditions of the innovation economy are also reflected in the functions of the innovation economy. The functions of the innovation economy are quite numerous, and the most important of them are outlook, innovation, social forecasting, systemic, educational, ecological, strategic, information communication, innovation activity, legal, intellectual, investment and organizational management. The creators of the theory of human capital showed education as the leading element of human capital and considered it necessary to constantly invest in it.

Becker showed the following two regularities of the "human capital" theory: 1) Investments in human capital are more profitable than investments in fixed assets. The efficient option is that the family should focus on wealth accumulation after first channeling their income to their children's education, and 2) The family's investment in their children is considered a family inheritance for them. If any family is stingy with their children's education expenses, then they are depriving them of this inheritance. H. Becker wrote in his work "Human capital": Human capital is the process of education and re-education (at school and in production) (Becker, 1994).

In the reports prepared by various international institutes and organizations on the development of human capital and human potential at the international level, human development indices and socio-economic indicators are compared in all cases, the paradigms of the modern era are taken into account, human capital with a long and healthy life and knowledge at a high professional level and issues of creating resources have become possible due to high technologies. The experience of highly developed countries whose technology and innovation markets are currently at the forefront of the oil economy and advanced countries that will be far ahead of other countries in terms of their level of technological development shows that careful attention to human capital, knowledge and skills. Directing the necessary resources for the development of technologies and human capital by the state at the required level, increasing investments in the development of human capital in this field, improving the living conditions of the population and raising the standard of living ultimately lead to further development of human capital and strengthening of the state, and stable development of society.

In order to develop human capital, it is important to seriously consider many issues in the countries. These include, first of all: 1) ensuring appropriate stable public order in the country; 2) strong attention to the functioning of laws and improvement of laws; 3) development of communications and creation of equal conditions for the development of every person; 4) taking continuous measures by the state for the development of society in general; 5) development of the education system, provision of wide spread of new innovations and information, communication technologies, digital mechanisms; 6) propensity of inventions and discoveries to technological knowledge, taking additional stimulating measures, developing the technology market in the country; 7) completing the creation of a new innovation system in the country, creation of a national innovation structure, creation of innovation zones in major cities and regions of the country; 8) formation of a network of innovation-oriented enterprises in the country, i.e. creation of production enterprises of competitive innovative products and provision of their access to world markets; 9) in the field of science and technology, strengthening international cooperation in the field of innovation development, taking additional measures to raise the standard of living of the population, adapting the welfare of the population and society to the challenges of the modern era; 10) taking measures to improve the relations

and atmosphere of trust between the state and the society, the population and the rulers of the country, the people and the leader, etc.

Industrial clusters and innovation

All the discussed above creates additional opportunities for the socio-economic development of the country, and in the realization of such opportunities, the cluster mechanism, including the opportunities and functions of industrial clusters, is considered to be one of the areas of activity that are convenient to operate widely. The development of various types of industry in industrial clusters, the creation of jobs in the directions we mentioned at the beginning, the formation of enterprises with high innovation capacity, and the provision of production of national brands and products to enter the world markets can allow more work to be done in this field. Industrial clusters are also a place of activity that provides a platform for bringing high technologies to the country and a favorable investment attraction. Foreign investments, especially with the arrival of direct investments to the country are encouraged by industrial clusters can be noticed as favorable places in a certain sense. Residents registered here can have a great effect on the socio-economic development of the areas where they are located, in strengthening the bridge between society and the state, in socialization and at the same time attracting intellectual resources to production areas. Industrial clusters also have the opportunity to make more contributions to the innovative development of the region, productive use of its resources, natural resources, and human capital (socialization and, at the same time, it can be very effective in attracting intellectual resources to production areas.) (Aliyev, 2015).

Industrial clusters at the world level perform very important functions in ensuring the development of innovative technologies, developing new innovations, testing them, applying them to production processes, and managing innovative technologies (Ahmadova, 2020). Industrial cluster is a multifunctional activity zone. Here investor companies, technological companies and technology centers, science and technology institutions, higher education institutions, scientific-research institutions, schools specialized in vocational education and state structures are united.

For example, in South Korea, development processes in this regard have gone very fast in the last 50 years, and currently South Korea is at the forefront of the world's most developed countries in terms of technological innovation. If we take Japan as an example, the experience of using cluster forms in the development of precision device manufacturing fields, intensive development of robotics, and high technology-based fields is noticeably. The organization development of human capital in these clusters, is also noteworthy. In many European countries - Germany, Great Britain, France, Italy, Netherlands, etc. important experience.

Clusters like this, with their multi-functional features, are used to mobilize human resources, gather intellectual resources, play a role as a favorable space for the development of innovations, apply and adopt innovations, bring together organizations interested in this field, and finance large investment and innovation projects. Industrial clusters are also sufficiently stimulated by the states. While keeping the activities of such industrial clusters in the center of attention, the states create appropriate conditions for the activities of these clusters, allocate land areas, give tax and customs concessions, and thus lead to much more attractive conditions for the activity of industrial clusters.

Industrial clusters started to form mainly after the 60s of the 20th century - during the period of accelerating the development of industries from a scientific and technical point of view. The creation of the Detroit automobile cluster for the technological improvement of the automobile industry in the United States and the intensification of the development processes of this field has enabled the automobile industry sector in this country to enter a new stage of development. It is interesting that this huge complex industrial cluster includes 3 large and famous American automobile industry giants - "General Motors", "Ford" and "Craisler". Thanks to such innovative clustering, the competitiveness of the country's automobile industry has increased significantly.

France, another developed country, is distinguished by the high level of interest in the creation of special innovation-industrial clusters. "Sofia Antipolis" and Marseille innovation clusters operating in this country are successfully implementing large-scale projects on the development and transfer of high technologies. In addition, in France, industrial clusters are widely used to increase the economic activity of depressed cities and regions of the country, and to solve socio-economic problems. Italy has made effective use of cluster models, especially industrial clusters, in accelerating the development of its specialized industries. A group of industrial products with high quality standards for export, which occupy an important place in the export potential of this country, are mainly produced in industrial clusters.

In Great Britain, a large electronic cluster was formed in the Newport region with the participation of investors from the United States and Japan. In this cluster system, which has been operating since the mid-1990s, the areas of

activity on the operation of automobile production, electronics, information technologies and telecommunications are considered more priority. About 40,000 people work in more than 1,500 companies in the innovation cluster operating in Cambridge. In Finland, effective experience in the implementation and operation of industrial clusters attracts attention. Here, especially, the cluster model applied in the forest industry plays a serious role in the socio-economic development of the country. In addition, in other priority areas the cluster mechanisms are actively used in the complex development of science and high technology-intensive industries such as telecommunications and chemistry. This way, for example, 20% of the world's paper exports are produced in Finnish clusters.

World economic processes constantly require the introduction of new mechanisms. Thus, as the global sphere of influence increases, economic transformations are deepening, and all this conditions the diversification of the structure of the national economy and the introduction of more efficient mechanisms. In particular, multifunctional economic mechanisms are of great importance in realizing the priorities of the development of economic sectors based on high technologies. Clusters are widely used for such purposes in the economically and technologically developed countries of the world. In addition to concentrating the same types of activity, clusters also include state and private structures, investment and innovation associations, production and service enterprises, as well as scientific research, combines higher education and vocational education institutions (Ketels, 2003).

In the clusters, conducting extensive research in the direction of certain activities, processing the obtained results and actively applying them to production, creating enterprises, sales and transport, and general approaches to the creation of logistics infrastructure are noteworthy. It is possible to achieve mutual review and justification of investment projects of investment and other financial funds included in the cluster, and the formation of more effective risk management mechanisms. Clusters are economic mechanisms based on the principle of complexity, which operate quite similar to each other, at the same time, it is created for the purpose of forming and organizing activities that are interrelated economic-cooperative processes. The main purpose of this type of clusters is the formation and development of the necessary infrastructure.

Human capital development and innovation in Azerbaijan

Analyzing the processes related to the development of human capital in Azerbaijan, considering the factors that determine the management of human capital with innovative technologies, taking measures with the creation and development of progressive economic mechanisms, including industrial clusters, require a complex and systematic approach. The formation and development of human capital, which is required for the economic progress of the country and the development of the economy based on high technologies, is one of the main conditions. The strategic importance of the education system in these processes is known to everyone, and this factor is evaluated at the most strategic level in the developed countries of the world (see table 1).

Table 1. Educational attainment of the population (per 1000 population aged 15 years old and over; at the beginning of the year)

Indicators	2001	2006	2011	2016	2021	2022
Population aged 15 years old and over, having higher and secondary education (completed and general), including:	939	946	968	972	974	974
higher education	108	118	124	127	137	140
specialized secondary education	114	93	85	85	85	86
completed secondary education	572	601	628	630	627	625
general secondary education	145	134	131	130	25	123

Source. Prepared by the author based on the data of ARDSK https://www.stat.gov.az

If we proceed from Table 1, continuous work is being done to increase the education level of all age groups of the population in the country. On the other hand, the policy of developing human capital in terms of conducting fundamental research and organizing scientific research in the country is noteworthy, for example, if the number of Doctor of Sciences and Doctors of Philosophy was 10,168 in 2000, this indicator was 14,351 in 2021 (see Figure 1).

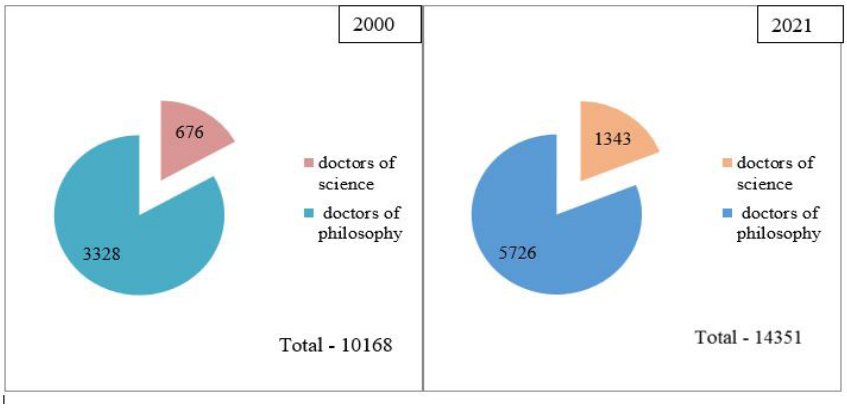

Figure 1. Number of researchers in Azerbaijan (at the end of the year), 2000 and 2021 years.

Source. Developed by author - based on the data of ARDSK - https://www.stat.gov.az).

Figure 2 shows a comparative analysis between 2010-2021 in the structure of production in the industrial sector in Azerbaijan. In 2000, the share of the processing industry, which plays a key role in the application of innovative technologiesand the formation of human capital, was 48%, and this indicator was 66% in 2021.

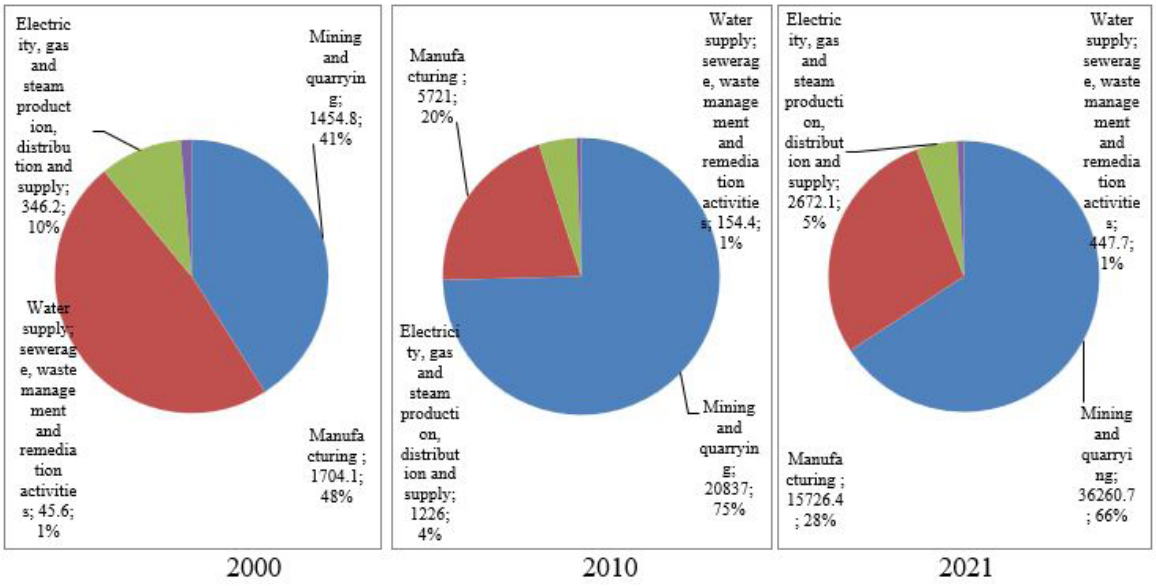

Figure 2. Comparative analysis between 2010-2021 in the structure of production in the industrial sector in Azerbaijan.

Source: owner elaboration

Figure 3 analyzes the per capita dynamics of the gross national income in Azerbaijan in 2011-2021, and this indicator was unstable during the analyzed period. For example, in 2011 this indicator was 6786.6 per person, in 2015 this indicator decreased to 5383.6 dollars, in 2020 it was 4253.7 dollars and at the end of 2021 it was at the level of 5338.9 dollars.

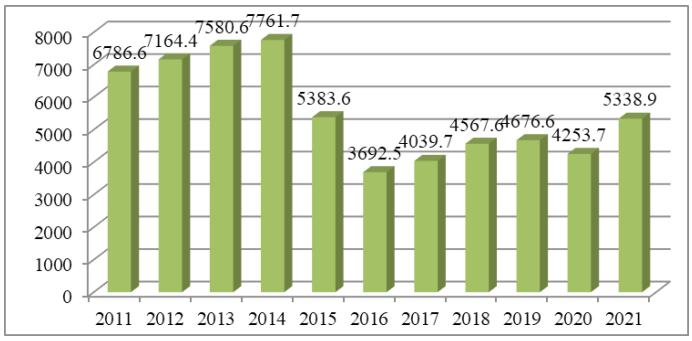

Figure 3. Dynamics of gross national income per capita in Azerbaijan, US dollars, 2011-2021.

Source. Prepared according to the data of ARDSK https://www.stat.gov.az).

Figure 4 shows the number of people working in unfavorable working conditions in the industrial sector in Azerbaijan between 2005-2021 - in conditions that do not meet sanitary and hygiene standards at the workplace. We believe that more targeted measures should be taken to eliminate or reduce such situations to a minimum level.

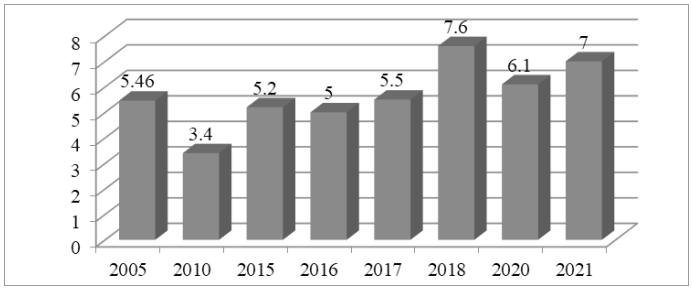

Figure 4. The number of workers in the industrial sector of Azerbaijan in jobs with difficult and harmful working conditions and workplaces that are not suitable for work due to climatic conditions, 2005-2021, thousand people.

Source. Prepared according to the data of ARDSK https://www.stat.gov.az).

Figure 5 analyzes the dynamics of the incomes and expenses of the population in Azerbaijan in the years 2005-2021, and it can be seen from here that although the incomes decreased in 2020 during the active period of the covid-19 pandemic, the growth rate was restored in 2021. This factor indicates that human capital occupies one of the important places in its development.

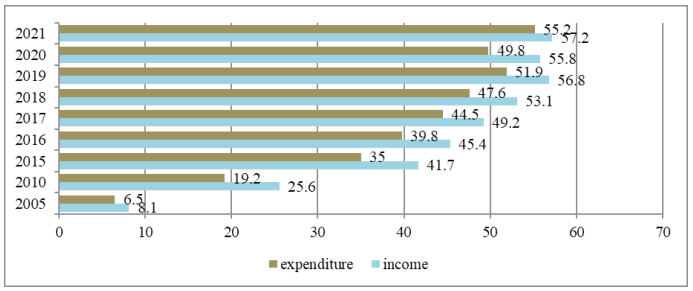

Figure 5. Dynamics of incomes and expenses of the population in Azerbaijan, billion manats, 2005-2021.

Source. Prepared according to the data of ARDSK https://www.stat.gov.az

Figure 6 analyzes the dynamics of the total product volume in the industrial sector of Azerbaijan in the years 2005-2021, and as it can be seen, a serious growth rate has been formed in 2021. In this regard, the creation of industrial clusters and the management of human capital with innovative technologies are promising. Opportunities for the development of industrial areas are increasing.

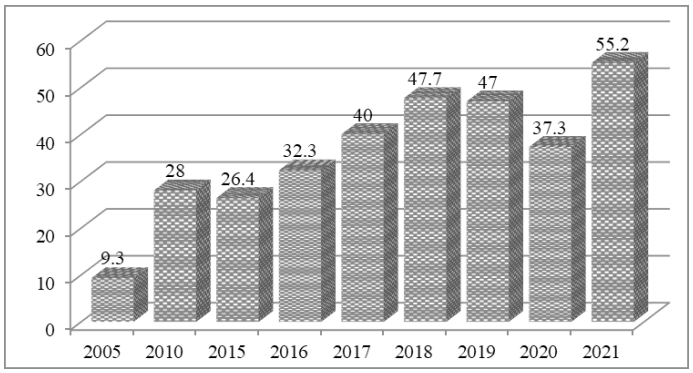

Figure 6. Dynamics of the total product volume in the industrial sector of Azerbaijan, 2005-2021, billion manats.

Source. Prepared according to the data of ARDSK https://www.stat.gov.az

Table 2 analyzes the dynamics of a group of indicators which affected the innovative development of the economy in Azerbaijan in 2015-2021.

Table 2. Dynamics of the main indicators affecting economic growth in Azerbaijan (2015-2021)

S/S	Indicators	Unit of measurement	2015	2016	2017	2018	2019	2020	2021
	funds directed to fixed capital	billion Man	15.96	15.77	17.4	17,24	18.5	17.2	16.8
	basic funds	billion Man	110.7	124	169.1	182.8	201.3	240.7	247.6
	credit investments in the economy	billion manats	21.7	16.4	11.8	13	15.3	14.5	17.1
	investments directed to the economy (by all sources)	billion manats	20.1	22.7	24.5	26	25.0	22.5	25.3
	including foreign investments	billion dollars	10.7	10.2	9.1	8.2	7.1	6.1	7.5
	including foreign direct investment	billion dollars	7.5	7.3	5.7	4.1	4.3	4.5	4.8
	to the non-oil sector	million dollars	860.4	1706.2	813	967.1	930.1	605.6	790.4

Source. Prepared by the author based on the data of ARDSK https://www.stat.gov.az

Judging from Table 2, the total amount of capital investment directed to the economy in 2015-2021 is 118.9 billion. manat. During that period, the total value of the main funds increased by 2.24 times and reached 248 billion manats in 2021. The volume of loans to the economy was unstable and averaged 14-15 billion per year, but the growth rate has increased in 2021. The growth rate of investments from all sources was also restored in 2021.

In Table 3, the volume of innovation products that underwent significant changes or were newly applied in Azerbaijan in 2010-2021 was analyzed by types of economic activity, and unfortunately, the indicators in this area are not satisfactory.

Table 3. Volume of innovative products that underwent significant changes or were newly applied in Azerbaijan in 2011-2021 by types of economic activity, thousand manats.

Types of economic activity	YEARS										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industry - total	13163	23052	11634	12319	929.7	35747	14777	28952.2	21698.1	11759.7	60977.2
Mining industry	2073	396.1	326	-	-	129.6	-	215.3	2495	2415.5	2843.4
Manufacturing industry, from them	11090	22656	11308	12319	929.7	35617	14777	28736.9	19202.4	9344.2	58133.8
Production of food products						402.5	590	831.2	328.0	-	3859.2
Beverage production	3500	18200		3974	758	41.5	-	-	-	-	-
Textile industry			8933	3098		12844	-	-	-	2121.3	-
Clothing industry						5213	-	-	-	-	-
Production of petroleum products			103.3				-	-	-	-	-
Chemical industry		3049	465.5	0.3	13.4	522.4	1705	55.0	-	-	-
Produc and plastic mass products						171.3	-	-	-	-	-
Production of building materials			1159			6586	-	-	-	-	-
Metallurgical industry						500	2176	7690.0	12560	2436.7	53035,2

Production of computers and other electronic equipment	5681	20.4		5101			9990	19937	6073	4742.0	1239.4
Production of machinery and equipment		890.3	238.4	145.5	158.3	174.9	216	222.8	241.2	44.2	-
Installation and repair of machinery and equipment	1295	496.8	511.6				-	-	-	-	-

Source. Prepared on the basis of a statistical collection of Azerbaijani industry

In Table 4, the dynamics of the volume of the improved innovation product in Azerbaijan in 2010-2021 by types of economic activity is reflected.

Table 4. Volume of improved innovation products in Azerbaijan in 2011-2021 by types of economic activity, thousand manats.

Types of economic activity	YEARS										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industry - total	14403	1045	883.1	1118	589.7	540.9	383.8	855.3	3905	16828	8305
Mining industry	10430	235.8	-	-	-	-	183.8	-	-	-	-
Manufacturing industry, from them	3973	809.6	883	1118	589.7	540.9	200.0	855.3	3905	16828	8305
Production of food products						-	-	-	21	-	-
Chemical industry	21.3	21.3	40.7	...	...	-	-	738.0	-	-	-
Metallurgical industry						-	-	-	3852	16800	8289
Production of machinery and equipment	682.2	682.2	798.3	462.9	430.0	524.8	167.1	82.8	-	-	-
Installation and repair of machinery and equipment	102.1	102.1	44.1	89.0	32.2	16.1	32.9	34.5	32.9	28.4	16.1

Source. Prepared on the basis of a statistical collection of Azerbaijani industry.

It is known that most countries have difficulty in developing the innovation system, creating a national innovation system, and purchasing innovative products. It should be noted that similar problems are quite typical for Azerbaijan: 1) A national innovation system has not been formed in Azerbaijan for many years; 2) Innovation of the country's enterprises and development based on innovative technologies is not ensured; 3) According to the calculations of many international institutions, including the World Bank, only up to 5 percent of the industrial enterprises operating in Azerbaijan are engaged in pro-innovation activities in one form or another; 4) Unfortunately, enterprises and companies operating in the industrial field are not interested in the development and production of innovations. One of the main reasons for this is the lack of high-level personnel, and on the other hand the lack of financial resources of these enterprises themselves.

Also, innovation processes are known to be quite complex. Here, the ideas and discoveries that human resources can reveal, the application of new innovations to production, the extensive use of the opportunities of industrial clusters in the processes of purchasing products, attract more attention in the modern era, and it is as a result of these processes that human capital is formed and developed, and intellectual resources are mobilized and used in these areas (Grigorescu et al., 2021). Of course, for this, continuous work must be done by the state and, first of all, the necessary laws of the country must be adopted, effective measures must be implemented, the unity of science and education must be ensured, it is important to take measures necessary for the faster development of human capital at the root of the state's policy in the field of science and innovation.

It is important to point out that in economically developing countries, including Azerbaijan, it is necessary to establish criteria for the sustainable development of the education and health system, raise education to a high level, and carry out educational reforms. From this point of view, the creation of industrial clusters can be evaluated as an economic

mechanism that can serve as a bridge between education and production areas and government institutions. It is possible to form and develop innovative economic areas by implementing the development and application of innovations in industrial clusters and at the same time productively using intellectual resources formed in the country. In terms of these factors, there are certain problems in Azerbaijan. However, in a certain sense, the measures taken in recent years are aimed at improving the innovation infrastructure and at the same time the processes related to the management of innovative technologies to effectively use human capital, etc. a number of economic mechanisms are being applied in this direction (Zaitseva, 2014) for example, creation of technological parks and high technology-based parks in Azerbaijan, organization of industrial parks, formation of industrial districts, etc. Such factors have formed serious grounds for the development of cluster institutes in industrial fields in the near future.

All this have also created additional opportunities for the development of the market of technologies and innovations in the country, the effective use of human capital resources related to the development of innovations, the unity of science and technology, and the stimulation of the activities of scientific workers and scientific research institutions. Creating an intellectual labor market, taking additional measures in a situation where the demand and supply of busy workers is formed based on science and innovation activity, surrounding people with stimulating mechanisms to make them work more productively, increasing wages, and the existence of an additional reward system - all this leads to the efficient use of intellectual resources and industrial clusters have great opportunities to cope with such tasks.

Then, in the conditions of economic and structural reforms in Azerbaijan, we have summarized a number of factors and priorities for a more optimal organization of human capital development, a higher level of organization of human capital management with innovative technologies in the industrial clusters proposed to be created:

- For the purpose of productive modeling of the use of human capital, in-depth analysis and evaluation of this capital in terms of its adequacy to the country's natural resources and productive forces should be ensured.
- In addition to improving the management mechanisms of human capital formation and development processes, effective use of available resources in this area, strengthening of the material and technical base and further development of the infrastructure network should be ensured.
- Adapting the health and education system, which plays an important role in the development of human capital, to the world experience in the market economy, intensifying the development of the private sector in these areas.
- Taking into account the important role of the continuous measures taken in the development of entrepreneurship and improvement of the business environment in the country in the formation of human capital, targeted investment and capital investment policies and management mechanisms should be developed and implemented.

CONCLUSIONS

In the conditions of current global threats, the processes related to the development of industries, consolidation of human capital and management of innovative technologies in the world market and at the world level have become quite complicated, and the formulation of the state policy of each country and the determination of conceptual approaches are very important conditions. Based on these, it is important to take into account modern technological requirements related to the development of human capital of the state. Therefore, taking continuous measures related to the development of human capital in the country, generalizing and mobilizing intelligence and skills, creating an infrastructure for acquiring modern knowledge, developing people in accordance with the requirements of the time, forming an appropriate infrastructure for demonstrating their skills and each person's own skills is of great importance in this context.

In the improvement of the structure of the country's economy and efficient use of human capital, there is a need to take continuous steps towards the realization of human resources and intellectual resources through the development of clusters, first of all industrial clusters, the acceleration of their application processes and the use of cluster mechanisms as multifunctional economic mechanisms. The formation and development of the main mechanisms of industrial clusters, the formation of strategic approaches to the creation and development of the cluster institute, the optimal determination of its organizational functions, the evaluation of the factors that play an important role in the acceleration of the economic development processes of clusters in global conditions, and the determination of action directions based on them were studied for the effective application in Azerbaijan. Then, in the conditions of economic and structural reforms in Azerbaijan, it is required to determine the development directions of human capital, attract intellectual resources to the era of technologies and innovations, form and develop the national innovation system, create innovation zones, develop

innovation infrastructure, and use industrial clusters as effectively as possible to realize innovation functions.

It is important to objectively analyze and evaluate the processes related to the development of human capital in Azerbaijan. Thus, improving the state policy in the effective use of human capital, directing more funds in the creation of a network of multifunctional mechanisms such as industrial clusters in this direction, increasing investments in the development of science and technologies, expanding scientific research and increasing the costs incurred in science, directing funds aimed at creating an innovation system, industry there is a serious need to take measures to expand innovations in the field and systematically implement all related works.

In the near future it is important accelerating the establishment of the national innovation system in Azerbaijan and developing industrial areas, increasing the role of human capital in the management of innovative technologies in these areas and applying innovative technologies to more industrial areas, developing the knowledge economy by using digital and "smart" technologies in more industrial areas and management. Consequently, there is a serious need to develop and implement more efficient state mechanisms in the direction of increasing the role of industrial clusters in the processes of application.

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