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OPPORTUNITIES FOR IMPROVING INNOVATION DEVELOPMENT IN AZERBAIJAN

Introduction. Recently, innovations based on scientific and technological achievements and research on an effective management system have become a key aspect of ensuring economic progress, competitiveness and sustainable socio-economic development. The role of scientific and technological development projects in the priority programs of the world's leading countries is noticeably increasing. From this point of view, the increasing predominance of the entrepreneurial sphere, including the activities of large and small enterprises, plays a crucial role in the introduction of innovative achievements in the production process. Thus, advanced technologies are becoming the main competitive field, and the scientific and technical sphere is the most important factor in geopolitics (Ivanchenko, 2020). At this time, the globalization of science, technology, and industry is giving a decisive impetus to the formation of new leaders not only among firms, but also among countries. Because it is only thanks to mobile, dynamic development that countries with advanced scientific and technological complexes, while maintaining their positions in the global struggle, can become one of the leading countries in the context of competition. In turn, innovation activity is defined as an activity (including scientific, technological, organizational, financial and commercial) aimed at the implementation of innovative projects, as well as the creation of an innovative infrastructure and ensuring its activities.

Based on Schumpeter's opinion, the central actor in the process of changes in the system is an entrepreneur who introduces innovations during a period of calm. These innovations lead to a loss of continuity, require the abandonment of the old (products, forms of organization, etc.) in favor of the new, risky, obsolete is displaced or, in other words, the process of "creative destruction" begins (Shumpeter, 1934).

Schumpeter also managed to elegantly focus the analysis of the economic development of the capitalist world exclusively on the economic elements of the process. The central argument of his frame of mind was that the most important role was given to entrepreneurship, with its inherent and deeply rooted innovative nature (Croitoru, 2008).

Zh. Barsh et al. point out that senior executives cite innovation as an important driver of growth, with only a few openly guiding and managing it. About 1/3 of the senior staff say that they manage innovation on an ad hoc basis when necessary. Another 1/3 of the members consider innovation management to be part of the top management team's agenda (Barsh, 2008).

F. Gallouj suggests that by studying innovations in the service sector, innovation researchers will have the opportunity to develop a comprehensive approach to innovation that applies to both the service sector and manufacturing and covers all aspects of the innovation process (i). In our opinion, this approach requires a reassessment of theories and models that have long been used in innovation the service sector and related fields. From this point of view, the innovation process needs new developments and tests in production conditions. On the other hand, it requires a thorough analysis of what we know about new theories and models used in the innovation process (Gallouj etc., 2009).

To form innovation strategies, it is necessary to take into account the so-called determinants of development. Determinants are factors that determine the direction of an enterprise's development, the possibilities and intensity of product renewal and the production apparatus. Objectively, there are common and specific determinants, in this case innovative ones (Antons, etc., (2017). Since innovation strategies are determined by the general strategies of the enterprise, these determinants should be taken into account when forming a portfolio of innovative strategies. However, taking into account the peculiarities of the latter, it is necessary to identify specific innovative determinants (Ismailov etc, 2024).

- The determinants of innovation are key factors (resource, organizational, economic, and personal) that determine the intensity, direction, and success of innovation implementation. The main group of determinants includes.
- Resource factors: availability of innovation base, equipment, technologies, material and financial resources.
- Organizational and managerial factors: management structure, development strategy, planning and coordination of innovation processes.
- Economic factors: market competition, the need to improve efficiency, demand for products.
- Scientific and educational potential: cooperation with scientific institutions, the level of education of employees.
- Personal factors: motivation, initiative, creativity of staff and management; Institutional and legal factors: the regulatory framework supporting innovation.

These determinants influence the creation of new goods, services, and technologies, ultimately aimed at making a profit. The innovative development of the economy contributes to increasing its competitiveness and ensuring sustainable growth dynamics. The formation of a global innovation economy is influenced by

many factors. Among these factors, some contribute to dynamic growth and have a positive impact on the innovative development of the economy, but also a number of factors act as a deterrent and restriction of innovation activity. The dynamic development of the innovative economy in modern conditions is associated with innovative technologies, which are an integral part of the socio-economic space (Klarin, 2019). The country's innovative development directly depends on the global scientific and innovation system, which allows for scientifically based research focused on economic and social efficiency. We believe that it is necessary to identify the factors influencing the innovative development of the economy. Identifying the main determinants affecting a country's innovation potential, the author notes that a discussion of the key determinants shows that they should be useful for policy makers who promote economic growth by increasing the productivity of firms in their countries (Tejinder, 2010).

The structure and research form of our research is aimed at achieving the goal of identifying the factors and conditions affecting the innovative development of the economy. Scientists in the field of dedicated research on the relationship between services, innovation and sustainable development, based on the results of a literature review, have directed their thoughts to discussing the boundaries of the developing field designated by the term “sustainability-oriented service innovation" (SOSI) (Calabrese etc., 2018). The complex application of research methods such as analysis and systematization, synthesis and comparison, analytical and graphical interpretation methods, etc. allows us to solve the research task. An important area of economic development is innovation, which is aimed at improving people's quality of life. The implementation of this project is due not only to the high level of innovation potential, but also to the high efficiency of management impact. Scientific and technological progress plays an important role in increasing the country's competitiveness. Also, sustainable socio-economic development is a prerequisite for the development of an innovative economy. Based on the monitoring of scientific papers, we believe that the country's innovative development will be shaped by the following factors: -the level of innovative development of the country; -the level of the country's competitiveness in the international market; - the nature of the development of the country's innovation activities; -the level of public-private partnership in the innovative development of the country; -the level of financing of innovation activities in the country; -foreign economic relations between the countries; - socio-environmental problems; - the level of protection of entrepreneurial and intellectual property; - personnel support for innovation activities.

The main role here is played by information about the number of organizations engaged in scientific research in the country. To clarify this indicator, we have taken statistical data from Azerbaijan. An analysis of data on the number of organizations engaged in research work in the period 2000-2025 in

Azerbaijan shows that during the study period, the number of organizations decreased by 5.1% or 7 enterprises (Figure 1).

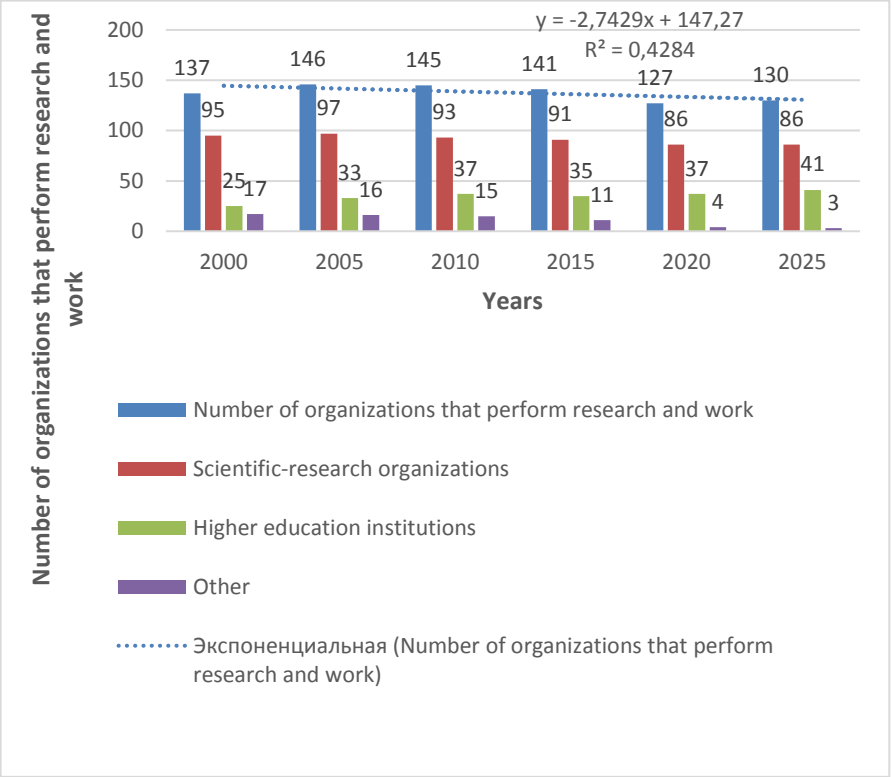

Figure 1. Number of organizations that perform research and work

Source: compiled by the author on the basis of data (https://www.stat.gov.az/source/education/2025)

The analysis of statistical data on science also shows that expenditures from the state budget on science in the comparative period (2000-2025) increased by 187.9 million manats ($110.4 million) or 20.2 times. The indicator of internal expenditures on scientific research and processing in the period under review also increased by 246.6 million manats ($144.9 million). Also, the indicator of expenditures on fixed assets for scientific research and processing increased by 61.5 million manats (36.1 million $) or 2.12 times. Thus, the analysis shows that the amount of funds allocated in Azerbaijan for the implementation of the above indicators is small and amounts to 0.5% of the total budget. Such a small quantitative assessment of this indicator can be justified by the large volume of investments made in 2020 in the restoration of territories liberated from

occupation, destroyed infrastructures with the Armenian armed forces and civilians.

Based on data from the foreword Global Innovation Index (GII), which reflects the dynamics of innovation in 139 countries and 100 leading innovation clusters in the world, this indicator comes at a crucial moment: after a decade of rapid growth in R&D spending and venture capital investments, there is a change. The growth rate of R&D has declined to the lowest since the global financial crisis, and global venture capital transactions have not recovered from a severe downturn in 2023 (https://www.wipo.int/web-publications/global-innovation-index-2025/en/foreword.html).

On the other hand, an analysis of the indicators of the countries ranked first in the regions of the world according to the Global Innovation Index in 2025 shows that Azerbaijan ranks 94th among 139 countries in the world (WIPO. Global Innovation Index (GII) 2025 rank. https://www.wipo.int/gii-ranking/en/rank).

GII data for 2020-2025 shows that the TOP 10 countries are arranged in the following order: Switzerland (1), Sweden (2), United States of America (3), Republic of Korea (4), Singapore (5), United Kingdom (6), Finland (7), Netherlands (8), Denmark (9) and China (10). And some CIS countries were ranked Russian Federation (60), Ukraine (66), Uzbekistan (79), Kazakhstan (81) and Azerbaijan (94). On the other hand, the analysis of the GII data shows that this indicator in Azerbaijan is 22.9, income group rank 30 and region rank 17. It should also be noted that at the time of the GII study, Switzerland held the first place, and Sweden the second place. But the United States, except for 2022 (ranked 2nd), took the 3rd position, the United Kingdom took the 6th place (moving two lines back), and China the 10th position (moving four lines forward). Of the TOP 30 countries in the world, 18 places were taken by the countries of the European region.

The effectiveness of innovation at different income levels in 2025 (three countries in each group): a) high-income countries are Switzerland, Sweden, United States; b) higher-middle-income countries are China, Malaysia, Turkiye; c) middle-income countries are India, Viet Nam, Philippines; d) low-income countries are Rwanda, Togo, Uganda.

The innovation tracking system at the global level allows you to get an idea of the innovation activity in the world at all four stages of the innovation cycle. The change in innovation activity in the world in 2024 compared to 2023 occurred in four marked stages as follows: 5.6% in investments in science and innovation, 65.7% in the technological process, 6.3% in the introduction of technology and 2.3% in the socio-economic impact. This year, data from the GII global innovation tracking system indicates that investments in innovation are mostly positive, with the exception of venture capital. At the same time, the pace of investment in innovation is record-low.

The Global Innovation Index (GII) for 2025 tracks the dynamics of innovation against the backdrop of different economic conditions, ongoing technological breakthroughs, and a changing regulatory framework that determines how ideas emerge, spread, and scale globally. GII Tracker makes this process every year, covering the main areas of innovation. At this stage, all aspects of the innovation process coverage are analyzed, in particular, four areas: investments in science and innovation, technological progress, technology adoption, and the socio-economic impact of innovation. The Global innovation dashboard data is shown in Table 2.

Table 2. The results of monitoring global innovations in the world on the above aspects covering the innovation process in 2025

1. Science and innovation investment

	Scientific publications	**R&D investments**		**Vencure capital**		**İnternational patent filings**
		Global total	TOP corporate R&D spenders	Deal numbers	Deal values	
Short term	5.6% 2023→2024	2.9% 2023→2024	3.2% 2023→2024	-4.4% 2023→2024	7.7% 2023→2024	0.5% 2023→2024
Long term (Annual growth)	4.2% 2014→2024	4.8% 2014→2024	8.1% 2018→2024	5.7% 2014→2024	11.9% 2014→2024	2.5% 2014→2024

2.Texnological progress

	Computing power		**Costs of renewable energy**		**Electric battery price**	**Cost of gemone seqnencing**	Drug approvals
	Moore ”s Law	Green super-computers	Solar photovoltaic	**Wing**			
Short term	36.5% 2022→2024	65.7% 2023→2024	-12.4% 2022→2024	-3.4 % 2022→2024	-20.1% 2023→2024	-11.1% 2022→2024	-18.8% 2022→2024
Long term (Annu	42.6 % 2014→2024	35.1% 2014→2024	-13.9% 2013→2024	-9.6 %	-16.7% 2014→	-21.5% 2014→2024	1.9% 2014→2024

al grout)				2013→ 2024	2024		

3.Technology process

	Safe sanitatiion	Connectivity		Robots	Electric cars	Hing-speed rail network	Cancer radiotherapy
		Fixed broadband	5G				
Short term	1.2% 2023→ 2024	6.3% 2023→ 2024	15.1% 2023→ 2024	9.7% 2022→ 2024	45.0 % 2023→ 2024	5.1% 2022→ 2024	1.3% 2023→ 2024
Long term (Annual grout)	2.2 % 2014→ 2024	8.2% 2014→ 2024	53.6% 2020→ 2024	12.4% 2013→ 2024	55.3 % 2014→ 2024	9.0% 2013→ 2024	1.8% 2014→ 2024
Penetration	58 per 100 inhabatants in 2024 (47 in 2014)	19 per 100 inhabatants in 2024 (10 in 2014)	51% 100global population in 2024 (9% in 2014)	n.a	4.5 of 100 cars in 2024 (0.07 in 2014)	5.6 per 100 km in 2024 (2.5 in 2014)	25 of 100 countries in 2024

4.Socioeconomic impact

	Labor productivity	Poverty	Life expectancy	Global warming
Short term	2.5% 2023→ 2024	-0.6% 2023→ 2024	0.7% 2022→ 2024	+1.29^0 C 2024
Long term (Annual grout)	2.2 % 2014→ 2024	-2.6% 2014→ 2024	0.3% 2013→ 2024	+0.75^0 C 2014
Level	54.715USD in 2024 (45.954 in 2014)	817 million in 2024 (1062 in 2014)	73 years in 2024 (71 in 2013)	n.a

Source: compiled by the author on the basis of (WIPO. Global Innovation Index (GII) 2025 rank. https://www.wipo.int/web-publications/global-innovation-index-2025/en/global-innovation-tracker.html)

The leading scientific and technological clusters (STCs) within the GII are territories with the largest number of inventors and scientists in the world, they can include entire regions or cities. According to statistics, Tokyo-Yokohama (Japan) became the leading scientific and technological cluster in 2024, followed by Shenzhen-Hong Kong, Guangzhou, Beijing, Seoul and Shanghai-Suzhou. For the second year in a row, China is the leader in the number of NTCs, followed by the United States of America. WIPO locates and ranks scientific and technical clusters using the geocoding method, comparing addresses and names taken from documents with an accuracy of 96%. The table below shows the TOP 10 S&T clusters in 2024 (Table 3).

Table 3. ТОП 10 S&T clusters, 2024

Rank	Clustr name	Economy	PCT applica-tion	Scientific publicati on	Share total PCT filings, %	Share of total pubs,%	Previous rank
1	Tokyo-Yokohama	JP	134.769	117.294	10.5	1.5	1
2	Shenzhen-Hong Kong Guangzhou	CN/HK	116.411	175.364	9.0	2.2	2
3	Beijing	CN	42.490	308.561	3.3	3.9	4
4	Seoul	KR	67.082	140.385	5.2	1.8	3
5	Shanghai-Suzhou	CN	38.699	191.074	3.0	2.4	5
6	San jose-San Fran-cisco, CA	US	49.299	57.589	3.8	0.7	6
7	Osaka-Kobe-Kyoto	JP	38.478	52.800	3.0	0.7	7
8	Boston Cembridje, MA	US	18.973	76.250	1.5	1.0	8
9	Nanjing	CN	7.857	125.607	0.6	1.6	12
10	San Diego, CA	US	24.555	20.292	0.3	1.9	9

Source: compiled by the autor on the basis of https://www.wipo.int/documents/d/global-innovation-index/docs-en-2024-gii-2024-cluster-methodology.pdf

An analysis of the data on these clusters shows that these clusters have different positions on different indicators. For example, the Tokyo-Yokohama cluster ranks first in terms of PCT application (134.769), and the Shenzhen-Hong Kong Guangzhou cluster ranks first in terms of the number of Scientific publications in the ranking. Practice shows that despite their location, each cluster has its own advantage in different indicators. And this process can affect their position in the world rank every year.

In developing countries, innovation research is expected not so much to answer questions about the number of innovative enterprises or even the

innovations themselves, as to provide information that would allow government and private entrepreneurs to analyze a variety of innovation strategies. In addition, it is also important to evaluate and understand how these strategies contribute to strengthening the competitiveness of individual enterprises and the overall economic and social development of the country. When researching and determining the innovation potential of firms in developing countries, special attention should be paid to such aspects of research as human resources, interconnections, information and communication technologies, their development and use. When adapting national innovation research to the conditions of developing countries, attention should be paid primarily to information and communication technologies, as well as the interrelationships and types of innovation activities (Germanovich, 2011).

And in the practice of developed foreign countries, the achievement of the highest technological standards and the development of productive forces are in the nature of government policy, not only at a specific time, but also for the future with different horizons of execution. It should be noted that there are two options for the activation and management of innovation activities.: 1. The Anglo-American model. 2. French-Japanese model. The fundamental difference between these models is the degree of government involvement in choosing development priorities and methods of supporting the innovation process. When choosing development priorities, the main focus is on creating favorable conditions for the business environment. Here, the government does not directly provide financial and direct economic support for the implementation of innovative projects of business entities. And when choosing to participate, the state will focus special attention on stimulating scientific research in priority areas of development and their state support.

Thus, the national technology policy in each country has a different characteristic. For example, in the United States, this policy is focused on such tasks as creating a business climate, for the prosperity of the private sector in the field of innovation, investing to support industry and trade development, ensuring the formation of a workforce capable of participating in a knowledge-based economy, etc.

Common government and innovation policies common to most Western European countries are: government financing of R&D, the impact of comprehensive business activities with appropriate tax policies, conducting research in research centers that are not beneficial to private capital, further development of the scientific and technical information dissemination system, etc.

Japan has developed a different mechanism for implementing innovation policy. The strategy formulated in the policy documents in their government is focused on ensuring the transition from the group of "following the leader" to the group of leaders in the field of R&D. This strategy is based on the need to reorient

the innovation sector to primarily develop and introduce domestic machinery and technologies into production. And this is stimulated by measures to develop basic research and measures to tighten patent licensing trade.

Conclusion. Thus, from the Western practice of managing innovative projects at enterprises, it can be concluded that reforms should not consist in individual changes in the system, but should be the embodiment of coordinated actions. In addition, changes and activities on many "fronts" of management require a well-developed mechanism for communication and coordination actions. In our opinion, this will have broad support from the political circles, the administration, scientific and innovative communities and the general public. Such an approach cannot be organized by creating temporary committees without giving proper political weight to both decision-making processes and budgets.

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