State Mechanisms for Stimulating Innovative Activities

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Abstract. The relevance of this study lies in the fact that innovation is now becoming a key driver of economic advancement in the developing world. This provides an opportunity to generate pro-poor growth, increase output, raise welfare levels with limited resources. Innovation, as a creative but pragmatic response to constraints of all kinds, and new technological and organisational solutions that have the ability to emerge in a specific context, is therefore important not only for economic growth but also for the development itself. Innovation policy requires action in many different areas, such as education, finance or science and technology, which require "a holistic government". The purpose of the study is to reveal the key mechanisms for stimulating innovation-related activities from the perspective of the state, to propose recommendations aimed at developing innovation activities in Azerbaijan and improving the mechanism that provides stimulating actions for innovation activities on the part of the state. The study is based on academic papers by European, American, Russian and other specialists dealing with innovations and the stimulation of innovation from a governmental perspective, and on international statistical data. The following methods were used in the study: synthesis, comparison, economic and statistical analysis, generalisation and interpretation of the findings, graphical representation of the data. The findings of this study enabled the development of recommendations based on the analysis to improve the government's work with different organisations involved in developing innovations in different sectors and areas of activity.

Keywords: Development of Innovation in the Country; Government Policy; Implemented in the Innovation Field; Innovation Capacity; Innovation Index; Innovative Entrepreneurship.
JEL Codes: H70 , O30.

1. INTRODUCTION

In the current economic conditions in the Republic of Azerbaijan, the key focus of the economic development strategy is the progressive development of the high-tech sector. This implies promoting innovative activities, introducing modern management mechanisms, increasing investment attractiveness, organising export-oriented production facilities, etc. Stimulating innovation policy of the state is a complex phenomenon that involves the national macroeconomic policy to create a favorable investment climate for the implementation of innovative projects, and the introduction of special incentives for innovative technological changes at the state level, which significantly affects the economy of the state, especially in today's conditions. For this purpose, Azerbaijan has ample opportunities, which were created back in the years of centralised governance. Stimulation of innovation and investment activities, intensification of joint-stock companies, improvement of the quality of corporate governance, expansion of high-tech activities, and introduction of its products into various sectors of the economy will certainly ensure stimulation of positive changes in the economic system of the Republic of Azerbaijan (Aliyeva, 2020). Innovation policy, which is implemented by the state, is linked to the development and implementation of a number of activities undertaken by the Government of Azerbaijan. Innovative activities are promoted by the state in accordance with the Annual Programme for the Promotion of Innovations. Funding for the implementation of this programme is reflected in the state budget as a separate line item (Safarov, 2021).

Currently, the process of national innovation system and provision of anticipatory development of science-intensive, high-tech industries is actively forming in Azerbaijan. The implementation of effective motivational mechanisms for stimulating innovative activity is primarily related to the improvement of the organizational and legal mechanism for the regulation of innovative entrepreneurship and the introduction of corrections at the regulatory and legal level. The assessment of the state of implementation of these provisions in the field of scientific and innovative activity shows that the innovative development of Azerbaijan takes place in the conditions of a contradiction between the objective laws of social development in terms of the existence of an urgent need for innovations and the existing conditions for their production and implementation, which ultimately requires legislative and methodological clarification of the problem.

Considerable work has been done to date in Azerbaijan to develop innovation, build an innovation ecosystem, and create a knowledge-based economy. Thus, within the framework of the implementation of Azerbaijan's National Devel-

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opment Plan, State programmes related to the digitalisation of Azerbaijan and the innovative development of Azerbaijan are being implemented (Zalizko et al., 2018; Alekhina, 2020b; Safarov, 2021). The necessary legislative and institutional framework and infrastructure have been established to systematically increase the share of innovative goods, works and services and to promote the development of technological entrepreneurship. Continuous efforts are being made to improve legislation based on best global expertise (Zalizko et al., 2018; Namazova, 2021; Safarov, 2021). To undertake the work involved in developing and implementing an innovation policy that can show results, Azerbaijan needs a state structure that is capable of regularly assessing the country's strengths and weaknesses and collecting the data required to conduct such assessments. This requires improving the quality of public administration in the innovation policy area, e.g. by providing universities with the resources and incentives they need to properly train future civil servants. This in itself can be an important aspect of the country's innovation policy mix (Aliyeva, 2020; Cervelló-Royo et al., 2022).

To ensure the long-term sustainable development of Azerbaijan and its transition to a knowledge-based economy, the development of science, the improvement of scientific infrastructure, and the strengthening of links between science and industry must be achieved first. In this regard, there will be a need for government support, creating a legislative framework that will be aimed at stimulating the production of competitive products by increasing innovation activity, and the effective use of innovation potential (Hernández-Ramírez et al., 2021). The Azerbaijani government should assist the entire innovation sector by investing in innovations, defining priorities for state innovation development, providing legal regulation of innovative activities, supporting human resources for the innovation sector, creating scientific and innovation infrastructure, providing information support for innovation activities, etc. In general, innovation regulation by the state should play a predetermining role in the development of innovation and technology (Abdikeev, 2019). Furthermore, the Government of Azerbaijan has the capacity to support innovation directly, either by funding public research or encouraging private investments in research, tax incentives that are related to innovations, and incentives that promote cooperation between industry and science. They can also promote innovation indirectly by providing a suitable environment for companies that are willing to invest and implement innovations (Alekhina, 2020b; Safarov, 2021).

The purpose of this study is to reveal the underlying mechanisms that have a stimulating effect on innovation activities on the part of the state. Also, on the basis of scientific works of European, American, Russian and other specialists and international statistical data to create recommendations aimed at the development of innovative activity in Azerbaijan and improvement of the mechanism of stimulating influence on innovative activity by the state.

Study objectives: to consider the theoretical aspect of innovation activity and features of state innovation policy; to analyse state innovation policy in the Republic of Azerbaijan; to develop recommendations that aim to develop innovation activity in Azerbaijan and improve the mechanism that has a stimulating effect on innovation activity on the part of the state.

2. MATERIALS AND METHODS

This study is based on the academic writings of European, American and Russian scholars who have studied the development of entrepreneurial activity both before and during the pandemic. The sources of information for the study were the State Statistical Committee in the Republic of Azerbaijan (2021) and its local agencies. The following methods were used in the study: synthesis, comparison, economic and statistical analysis, generalisation and interpretation of the findings, graphical representation of the data. The study of the subject was carried out in two stages:

1. The first stage involved an analysis of innovation activity in Azerbaijan and state incentives for this activity according to a number of indicators, which are published on the official website of the State Statistical Committee in the Republic of Azerbaijan (2021) and the official website of the Global Economy (2021). According to the official data published on the official website of the State Statistical Committee in the Republic of Azerbaijan (2021), the analysis included the following indicators: number of organisations engaged in research and development (R&D) in Azerbaijan for 2019-2021; number of employees engaged in research and development in Azerbaijan for 2019-2021; number of employees engaged in research and development in Azerbaijan for 2019-2021; state budget expenditure related to science in Azerbaijan for 2018-2020; financial sources of domestic expenditure related to research and development in Azerbaijan for 2018-2020; distribution of domestic expenditures related to research and development by sector in Azerbaijan for 2018-2020; main indicators of innovation activity, the volume of innovation product by innovation level and type of economic activity in Azerbaijan for 2018-2020; expenditure on technological innovations in industry by type of innovation; expenditure on technological innovations by type of activity in Azerbaijan for 2018-2020; expenditure on technological innovations by area of use in Azerbaijan for 2018-2020; factors that act as barriers to innovation in sectoral enterprises of Azerbaijan for 2018-2020; financing of science, research and development in Azerbaijan for 2017-2019.

The first stage of the study conducted was an analysis of the Global Innovation Index (GII) for 2021 in Azerbaijan, based on official data published on the website Global Economy (2021). This analysis included the following indicators: Global Innovation Index 2021 ranking in relation to Azerbaijan's indicators; GII 2021 ranking on a range of indicators related to the development of innovations in Azerbaijan; strengths and weaknesses of Azerbaijan's innovations in GII for 2020; strengths and weaknesses of Azerbaijan in GII for 2020 according to the seven pillars of GII; research and development expenditure in Azerbaijan over the period 1996 to 2018; information technology (IT) exports in Azerbaijan in 2019; exports of high technology (hi-tech) in Azerbaijan in 2020; exports of hi-tech, percentage of finished goods exports in Azerbaijan in 2018; patent applications from residents in Azerbaijan in 2019. To fully determine Azerbaijan's position on the global stage in terms of innovation, Azerbai-

Table 1. Form of Classification of Innovation Incentives for Enterprises/Organisations.

Form of Incentive	Classification Attribute												
	Innovation Process Stage				Incentive Agent			Incentive Method		the Form of Revenue to the Budget			
	FR	AR	DA	C	FBF	RBF	MBF	RB	NB	I	T	D	M
To ensure the possibility of providing grants													
To ensure the possibility of obtaining state guarantees													
To ensure the possibility of granting property lease privileges													
To ensure the possibility of granting subsidies for reimbursement of R&D costs													
To ensure the possibility of granting an investment tax credit													

Note: FR – fundamental research; AR – applied research; DA – development activity; C – commercialisation of an innovative project; FBF – federal budget funding; RBF – regional budget funding; MBF – municipal budget funding; RB – refundable basis; NB – non-refundable basis; I – income in the form of interest; T – income in the form of tax; D – income in the form of dividends; M – income in the monetary form.

jan's ranking on the Human Development Index was analysed, as the development of any area of activity in any country in the world depends on human capital.

2. Based on the analysis carried out during the first stage of this study, shortcomings were highlighted. As a result, the second stage involved the development of recommendations, aimed at developing innovation activities in Azerbaijan and improving the mechanism of incentives for innovation-related activities on the part of the state. The suggested recommendations will enable the government of Azerbaijan to review the development strategy and amend it according to the proposed recommendations. These recommendations can be implemented in other Commonwealth of Independent States (CIS) countries to develop an innovation strategy for the country's economy.

3. RESULTS AND DISCUSSION

Innovation is considered as the introduction of a new or significantly improved product, good or service; a new marketing approach; or a new organisational method in business practice, workplace organisation or external relations; and also considered as a creative result that can be put into economic circulation as a new or improved technological process, as a new or improved product or service (Abdikeev, 2019; Alekhina, 2019a; Alekhina, 2019b; Najafov, 2021). Innovation policy, which is implemented by the state, also refers to the entire set of tools, forms, methods and areas of purposeful impact on the elements of the market structure. It is aimed at accelerating the development and manufacture of new products and introduction of new technologies. State support for innovation-related activities, as an economic category, refers to the coordination of economic processes, as a set of measures emanating from state institutions. It is defined in the formation and development of innovation activities (Alekhina, 2019b; Alekhina, 2019c). Modern economic literature considers three main types of innovative entrepreneurship: product innovation; technology innovation; social innovation (Alekhina, 2019b). The enterprise has to attract scientific and technical personnel, production staff, i.e. labour force, by investing certain monetary resources to carry out innovation-related activities (Namazova, 2021; Peyravi et al., 2021). Actions of an incentive nature regarding innovation-related activities are one of the main components in the motivation function. They should be a single complex, interchangeable and complementary, which determines the need to consider the whole system of motives and incentives holistically (Alekhina, 2020a; Alekhina, 2020c; Parakhina, 2021).

The starting point in creating such a holistic system of motivation for innovative activity is the identification of approaches, forms and levels of its implementation (Parakhina, 2021). Various specialists dealing with stimulating actions on innovation-related activities in different countries have concluded that stimulating actions on innovation-related activities take three main forms: implementation of public support for innovation-related activities; implementation of extrabudgetary funding; implementation of motivation among innovation actors (Alekhina, 2019c; Alekhina, 2020c; Parakhina, 2021). The specific conditions under which innovation-related entrepreneurship is formed, operated and developed act as incentives. The development dynamics of entrepreneurial activity, from the early stage to stable businesses, are mediated by the impact of environmental factors (Alieva, 2020). To understand what the organisation is working with regarding innovation-related activities, each organisation/enterprise fills out a tabular form and indicates with a plus/check mark exactly what it is working with (Table **1**) (Gokhberg, 2021).

These forms of incentive action regarding innovation-related activities have both a tangible (financial and economic) and

an intangible (socio-psychological) basis, which is quite logical. The forms of incentives for innovation-related activities also have an external (incentive actions regarding innovation-related activities of organisations on the part of the state) and internal (incentive actions regarding innovation-related activities within the organisation) basis. The purpose of implementing public actions of an incentive nature regarding innovation-related activities is to assess the impact of various forms of incentive actions regarding innovation-related activities on the innovative activity of companies in the current conditions of Azerbaijan. On this basis, the opportunities and areas of innovative development of its economy are identified. The state should finance innovation projects directly and encourage investment in innovation projects by private and state-owned enterprises. This should be done by creating favourable conditions for those enterprises that introduce advanced techniques and technologies, and conduct research and development activities. An analysis of the areas of support for the development of innovations suggests that today the area of innovation focus is mainly on industrial enterprises. It also includes those involved in agriculture, IT and nanotechnology, medicine and pharmacology, mining and energy (Gokhberg, 2021).

Currently, the measures for stimulating innovations as part of innovation policy have a wide range of implementation: from simple financial support for innovation and investment projects to the organisation of communication platforms for active dialogue and cooperation among all stakeholders. The impact that each of the incentive instruments (varied in specifics and intended effects) has on the innovative activity of business entities is quite ambiguous. It is assessed differently by experts, top managers of large companies and government representatives. The development of a system of incentive actions regarding innovation-related activities in Azerbaijan is carried out through the provision of budgetary grants in the economy to: provide research and development (R&D) activities; carry out the design and implementation of corporate innovation development programmes by public corporations and companies with state participation; ensure increased state support for innovation-active small companies through various structures for the promotion of small-scale enterprises in the scientific and technical field; ensure the establishment of amortisation periods for intangible assets that are directly used in scientific, technical and production activities; implement support through targeted programmes and form "innovation clusters" involving universities, scientific institutions, corporations, and companies with state participation (Zalizko et al., 2018; Safarov, 2021).

The stimulation of innovations is closely linked to the attraction of co-investment in innovation projects and is dependent on the established structure of financing innovative activities. There are numerous, interrelated, system-integrated types of stimulating action regarding innovation-related activities that take various forms (Zalizko et al., 2018; Safarov, 2021). To assess the achievement of the targets for the development of the innovation economy within the incentive action mechanism regarding innovation-related activities, there should be an effective feedback tool – a subsystem for monitoring the results of innovation activities and the effectiveness of the implemented methods of innovation support. The innovation strategy system implemented in an organisation helps to stimulate ideas, creativity, competence and problem-solving ability. It can stimulate regular innovations when innovative activities are embedded in the daily work practices of employees. The innovations implemented by employees refer to the generation and implementation of new ideas, products and processes arising from the interaction of employees unrelated to this task. Innovations can occur spontaneously, informally and unplanned, but can also be structured into formal and organised activities for successful development of human resource capacity (Roshchupkina, 2020). According to many experts, Azerbaijan's place in global innovation processes is not yet adequate to the country's intellectual and educational potential. The main indicators related to research and development will be analysed using data published in the annual statistical compendium for Azerbaijan. Table **2** presents the number of organisations engaged in R&D at the beginning of 2021 (Zeynalli, 2020; State Statistical Committee…, 2021).

Table 2. Number of R&D Organisations in Azerbaijan for 2019-2021 (Beginning of the Year).

Indicator	2019	2020	2021
Total	133	132	127
including:			
research organisations	88	88	86
HEIs	39	39	37
other	6	5	4

Note: HEI – higher education institution.

The data in Table **2** show that research and development organisations are the most involved, but their numbers have been declining over the whole analysed period. Other types of institutions do the least amount of studies, since after research organisations, more research and development is carried out at universities. Table 3 presents the characteristics of R&D personnel at the beginning of 2021 (State Statistical Committee…, 2021).

Table 3. R&D Personnel in Azerbaijan for 2019-2021 (at the Beginning of the Year, Persons).

Indicator	2019	2020	2021
Overall			
Employees engaged in research and development	20179	20790	20522
including:			
researchers	14412	15125	14987
technicians	1771	1559	1722
support staff	2309	2351	2213
other personnel	1687	1755	1600
Number of teaching staff engaged in pedagogical and scientific-technical activities	7069	8415	9932

Doctors of Sciences			
Employees engaged in research and development	1415	1466	1433
including:			
researchers	1414	1459	1429
support staff	-	4	1
other personnel	1	3	3
Number of teaching staff engaged in pedagogical and scientific-technical activities	800	993	1034
Doctors of Philosophy			
Employees engaged in research and development	6137	6302	6218
including:			
researchers	6064	6203	6124
technicians	38	55	53
support staff	35	31	37
other personnel	-	13	4
Number of teaching staff engaged in pedagogical and scientific-technical activities	3775	4537	4834

Table **3** indicates that among all categories of staff involved in R&D, researchers are the most numerous. Teaching and research staff are second, followed by support staff in third place, technicians – in fourth place, and other personnel – in fifth place. The conclusions can be drawn, when examining this indicator by the categories of doctors of sciences and doctors of philosophy. Research and development staff in the category of "Doctors of Science" have the highest number of researchers and academics engaged in pedagogical and scientific-technical activities. There are no technicians in this category. Research and development staff in the category of "Doctors of Philosophy" have the highest number of researchers and academics engaged in pedagogical and scientific-technical activities. Table **4** presents the state budget expenditure related to science in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Table 4. State Budget Expenditures Related to Science in Azerbaijan for 2018-2020.

Indicator	2018	2019	2020
Expenditures related to science in total, million manat	117.8	122.3	143.6
percentage:			
to GDP of the state budget	0.15	0.15	0.20
in relation to state budget expenditure	0.52	0.50	0.54

Note: GDP – gross domestic product.

Table **4** demonstrates that expenditure on science is increasing year by year. This is a positive factor for the development of the republic's innovation potential and provides an opportunity to build up a competitive advantage over competitors, both domestically and internationally. Table **5** presents the financial sources of domestic R&D-related expenditure in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Table 5. Financial Sources of Domestic R&D-Related Expenditure in Azerbaijan for 2018-2020.

Indicator	2018	2019	2020
Domestic expenditure allocated to research and development, million manat	147.5	163.9	162.5
including those financed at the expense of:			
budgetary funds	101.3	120.6	122.7
extra-budgetary funds	0.8	0.9	1.3
the organisation's own funds	14.1	12.1	9.5
the client's own funds	31.3	30.3	29.0
budgetary allocations to support the HEI	-	-	-
foreign source	-	-	-

The data in Table **5** indicate that among the domestic costs associated with research and development, the budgetary funds are growing year by year. This is a positive factor for the development of innovation activities, as it shows that the government of the republic is interested in research and development. The second largest domestic cost associated with research and development is the client's own funds, which are decreasing year by year. The third place among the domestic costs related to research and development is occupied by the organisation's own funds. They have a negative dynamics associated with the reduction of the indicator from year to year. The fourth place among the domestic costs related to research and development is occupied by extra-budgetary funds. They have a positive dynamics associated with the growth of the indicator throughout the entire analysed period. There are no budgetary allocations to support the HEI and no foreign sources throughout the analysed period. Table **6** presents the domestic costs associated with conducting research and development by sector in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Table 6. Distribution of Domestic Expenditure on R&D by Sector in Azerbaijan for 2018-2020.

Indicator	2018	2019	2020
Domestic R&D expenditure, million manat	147.5	163.9	162.5
including:			
public sector	125.9	134.9	139.1
private sector	3.6	6.1	5.5
higher education institutions	18.0	22.9	17.9

Table **6** indicates that among the domestic R&D expenditure operating by sector, the public sector stands out, with year-on-year growth throughout the period under analysis. In sec-

Table 7. Volume of Innovation Product by Innovation Level and Type of Economic Activity in Azerbaijan for 2018-2020, Thousand Manat.

Indicator	Significant Changes that Take Place in Production or are Related to the Manufacture of a New Applied Product			Introduction of Changes to Product Characteristics and Properties Related to their Improvement		
	2018	2019	2020	2018	2019	2020
All industries	28952.2	21698.1	11759.7	855.3	3905.9	16828.4
Mining	215.3	2495.7	2415.5	-	-	-
Production	28736.9	19202.4	9344.2	855.3	3905.9	16828.4
Food production	831.2	328.0	-	-	21	-
Industry related to textile production	-	-	2121.3	-	-	-
Manufacture of leather and leather goods	-	-	-	-	-	
Chemical industry	2055.0	-	-	738.0	-	-
Metallurgical industry	7690.0	12560.0	2436.7	-	3852.0	16800.0
Manufacture of computers and other electronic equipment	19937.9	6073.2	4742.0	-	-	-
Manufacture of machinery and equipment	222.8	241.2	44.2	82.8	-	-
Repair and installation of machinery and equipment	-	-	-	34.5	32.9	28.4

ond place among the domestic R&D expenditure operating by sector are HEIs, but their figures are not stable year on year. Thus, in 2020 the indicator was lower than in 2018-2019. In 2019, however, the indicator was 27.2% higher than in 2018, and in 2020 it was 21.8% lower than in 2019. Table **7** presents the volume of innovation product by innovation level and economic activity in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Based on the data in Table **7**, according to significant changes that takes place in production or related to the production of new applied products, the manufacture of computers and other electronic equipment is leading in 2020 – 4742.0 thousand manat. The second place is occupied by metallurgical industry (2436.7 thousand manat), the third place – mining industry (2415.5 thousand manat), the fourth place – textile industry (2121.3 thousand manat). The last place with the lowest indicator belongs to the manufacture of machinery and equipment (44.2 thousand manat). There is no indicator for the production of leather and leather products or the repair and installation of machinery and equipment. Considering types of productions on improvement of characteristics and properties, the leader is metallurgical industry (16800.0 thousand manat), the second place is occupied by repair and installation of machines and equipment (28.4 thousand manat). There is no indicator for other types of production. Table **8** presents the costs of technological innovation in industry by type of innovation in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Table 8. Costs of technological innovation in industry by type of innovation in Azerbaijan for 2018-2020, thousand manat

Indicator	2018	2019	2020
All industries	34353.6	48037.1	35919.8
product innovations	23298.7	38343.5	20059.2
technological innovations	11054.9	9693.6	15860.6
Mining industry	1386.0	378.6	1001.1
product innovations	679.3	290	638.2
technological innovations	706.7	88.6	362.9
Manufacturing industry	32967.6	47658.5	34918.7
product innovations	22619.4	38053.5	19421.0
technological innovations	10348.2	9605.0	15497.7
Food production	-	208.7	8667.0
product innovations	-	208.7	8667.0
Beverage industry	338.0	642.0	-
product innovations	336.0	642.0	-
technological innovations	2	-	-
Tobacco production	-	26994.1	-
product innovations	-	26994.1	-
Textile industry	-	-	250.0
product innovations	-	-	250.0
Printing industry			
product innovations	237.0	11.5	-
Chemical industry	215.4	-	-
product innovations	214.4	-	-
production innovations	1	-	-

Manufacture of other non-metallic mineral products	3081.6	-	512.2
product innovations	3081.6	-	12.2
process innovations	-	-	500.0
Base metals production	44.0	4202.2	12479.2
product innovations	144.0	4202.2	3983.2
process innovations	-	-	8496.0
Manufacture of fabricated metal products, except machinery and equipment	1216.9	83.0	10.3
product innovations	1216.9	83.0	8.6
process innovations	-	-	1.7
Manufacture of machinery and equipment	17215.6	15500.0	9500.0
product innovations	17204.3	5900.0	3000.0
technological innovations	11.3	9600.0	6500.0
Furniture manufacturing	534.9	-	3500.0
product innovations	175.2	-	3500.0
process innovations	359.7	-	-
Repair and installation of machinery and equipment	9984.2	17.0	-
product innovations	10.0	12.0	-
process innovations	9974.2	5.0	-

Table **8** demonstrates that the greatest number of product innovations by the end of 2020 is recorded in the manufacturing industry, while the least number is recorded in the manufacture of other non-metallic mineral products and in the manufacture of fabricated metal products, except machinery and equipment. The greatest number of technological/process innovations has been recorded in manufacturing industry and basic metals production. The least technological/process innovations are recorded in the manufacture of fabricated metal products, except machinery and equipment. Table **9** presents the costs of technological innovations by type of activity in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Table 9. Expenditures on Technological Innovation by Type of Activity in Azerbaijan for 2018-2020, Thousand Manat.

Indicator	2018	2019	2020
All industries	34353.6	48037.1	35919.8
The company's own funds	34278.0	47319.7	17631.9
Mining industry	1386.0	378.6	1001.1
The company's own funds	1386.0	320.2	626.2
Manufacturing industry	32967.6	47658.5	34918.7
The company's own funds	32892.0	46999.5	17005.7
Food production	338.0	208.7	8667.0
The company's own funds	338.0	208.7	-
Beverage industry	-	642.0	-
The company's own funds	-	-	-
Tobacco production	-	26994.1	-
The company's own funds	-	26994.1	-
Textile industry	-	-	250.0
Printing industry	237.0	11.5	-
The company's own funds	233.4	11.5	-
Chemical industry	215.4	-	-
The company's own funds	215.4	-	-
Manufacture of other non-metallic mineral products	3081.6	-	512.2
The company's own funds	3081.6	-	12.2
Base metals production	144.0	4202.2	12479.2
The company's own funds	72.0	4202.2	3983.2
Manufacture of fabricated metal products, except machinery and equipment	1216.9	83.0	10.3
The company's own funds	1216.9	83.0	10.3
Manufacture of machinery and equipment	17215.6	15500.0	9500.0
The company's own funds	17215.6	15500.0	9500.0
Furniture manufacturing	534.9	-	3500.0
The company's own funds	534.9	-	3500.0
Repair and installation of machinery and equipment	9984.2	17.0	-
The company's own funds	9984.2	-	-

Table **9** indicates that the greatest amount of own funds for technological innovation in Azerbaijan is spent in the manufacturing industry, in enterprises related to the production of machinery and equipment, and in enterprises engaged in the manufacture of furniture. The least amount of own funds is spent on technological innovations by companies associated with the manufacture of other non-metallic mineral products, and the manufacture of finished metal products, except machinery and equipment. Table **10** presents the costs of technological innovations by area of use in Azerbaijan for 2018-2020 (State Statistical Committee…, 2021).

Table 10. Costs of Technological Innovations by Areas of Use in Azerbaijan for 2018-2020, Thousand Manats.

Indicator	2018	2019	2020
All industries	34353.6	48037.1	35919.8
application and processing of new products, services	11119	9600	7000

acquisition of machinery and equipment related to technological innovations	4578.5	32360.0	15292.7
acquisition of new technologies	185.2	71.5	1754.5
acquisition of products related to software	957.9	41.0	8497.7
forecast for the production of new products, application of new services or methods by type of preparation to other productions and their release	6200.0	5900.0	3000.0
conducting new marketing research	-	-	-
training and providing employees with everything they need to work with innovations	-	12	-
research and development	9944.5	22.4	-
acquisition of technologies through the creation of JV with third parties and payment for their services	151.1	-	-
expenses for services provided by third parties	1.0	-	362.9
expenses for technological innovations	1216.4	30.2	12
Mining industry	1386.0	378.6	1001.1
application and processing of new products, services	-	-	-
acquisition of machinery and equipment related to technological innovations	679.3	290.0	626.2
acquisition of new technologies			
acquisition of products related to software	555.2	36	-
forecast for the production of new products, application of new services or methods by type of preparation to other productions and their release	-	-	-
conducting new marketing research	-	-	-
training and providing employees with everything they need to work with innovations	-	-	-
research and development	-	22.4	-
acquisition of technologies through the creation of JV with third parties and payment for their services	151.1	-	-
expenses for services provided by third parties	-	-	362.9
expenses for technological innovations	0.4	30.2	12.0
Manufacturing industry	32967.6	47658.5	34918.7
application and processing of new products, services	11119	9600	7000
acquisition of machinery and equipment related to technological innovations	3899.2	32070.0	14666.5
acquisition of new technologies	185.2	71.5	1754.5
acquisition of products related to software	402.7	5.0	8497.7
forecast for the production of new products, application of new services or methods by type of preparation to other productions and their release	6200.0	5900.0	3000.0
conducting new marketing research	-	-	-
training and providing employees with everything they need to work with innovations	-	12	-
research and development	9944.5	-	-
acquisition of technologies through the creation of JV with third parties and payment for their services	-	-	-
expenses for services provided by third parties	1	-	-
expenses for technological innovations	1216.0	-	-

Note: JV – joint venture.

Table **10** reveals that the most expenditure on technological innovation is concentrated in the following areas (for all sectors): acquisition of machinery and equipment, which are related to technological innovations; acquisition of software products; applications and processing of new products, services. The least concentrated areas of expenditure on technological innovation are (for all sectors): expenditure on services provided by third parties and cost of technological innovation. Table **11** presents the factors that act as barriers to innovations in sectoral enterprises of Azerbaijan for 2018-2020 (Global Economy, 2021).

Table **11** shows that the main or decisive economic factors are: own funds, lack of financial support and high economic risk; essential are own funds, low effective demand for new products, high cost of innovation; insignificant are lack of financial support and long payback period. The main or decisive importance among production factors is attributed to the low innovation capacity of the enterprise. Factors of significant importance are: low enterprise innovation capacity and enterprises not implementing innovation. Insignificant importance is attributed to: low capacity of qualified workers, lack of market information, lack of cooperation with other enterprises and research institutions. Other factors of major or decisive importance include: an untapped technology market; factors of significant importance are: lack of innovation infrastructure development (intermediary, information, legal, banking, other services), lack of need for innovations, as they have already been introduced before, inconsistency of legal and regulatory documents regulating and stimulating innovation activities; factors of insignificant importance include: lack of need for innovations, as they have already been introduced before, uncertainty in terms of the innovation process, an untapped technology market. Table **12** presents the characteristics of science and R&D funding in

Table 11. Factors that Act as Barriers to Innovations in Sectoral Enterprises of Azerbaijan for 2018-2020.

Indicators	Number Of Enterprises Engaged In Assessing Barriers To Innovations								
	key or Decisive Importance of Factors			Significant Importance of Factors			Insignificant Importance of Factors		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Economic factors									
own funds	23	23	13	28	32	27	14	10	8
lack of financial support from the state	11	15	8	16	12	7	19	21	15
low effective demand for new products	5	6	3	21	22	16	11	13	9
high cost of innovation	13	19	4	23	22	17	11	11	6
high level of economic risk	11	16	5	16	15	14	13	15	10
long payback period	3	6	3	20	20	10	17	24	19
Factors of production									
low innovative capacity of the enterprise	7	10	7	29	21	12	14	12	8
low capacity of qualified workers	3	4	3	16	14	11	18	27	19
lack of information about new technologies	4	3	3	18	13	10	14	19	11
enterprises have not implemented innovations	3	1	3	8	10	13	18	21	8
lack of market information	3	2	1	16	16	6	13	17	12
lack of cooperation with other enterprises and scientific institutions	1	1	-	7	5	3	16	24	16
Other factors									
lack of need to introduce innovations, as they have already been introduced before	1	1	-	10	11	10	16	18	12
inconsistency of legal and regulatory documents that regulate and incentivise innovation-related activities	3	2	1	13	12	10	13	16	6
uncertainty in terms of the innovation process	1	2	1	10	9	5	14	18	13
lack of development of innovation infrastructure (intermediary, information, legal, banking, other services)	3	2	1	15	11	13	15	17	7
untapped technology market	2	3	2	17	14	7	18	16	13

Azerbaijan for 2017-2019 (State Statistical Committee…, 2021).

Table 12. Science and R&D funding in Azerbaijan for 2017-2019

Indicator	2017	2018	2019
Funding for science from the state budget			
Expenditure on science from the state budget, million manat	109.8	117.8	122.3
as a percentage of GDP	0.16	0.15	0.15
as a percentage of state budget expenditures	0.62	0.52	0.50
GERD			
Gross expenditure related to R&D – total, thousand manat	132340.0	150532.1	171067.6
including:			
internal costs of R&D	129871.8	147468.3	163890.4
of which:			
current internal R&D expenditures	127997.0	144997.9	161299.9
capital expenditure on R&D	1874.8	2470.4	2590.5
external costs of R&D	2468.2	3063.8	7177.2

Note: GERD – gross expenditure on R&D.

Table **12** shows that the indicator for financing science from the state budget as a percentage of state budget expenditure is higher than as a percentage of GDP, and that the indicator is decreasing every year. When analysing gross expenditure on R&D, it can be concluded that current internal costs of R&D are significantly higher than capital expenditure on R&D and external costs of R&D, and for each indicator the figure is increasing year by year. The Global Innovation Index (GII) for 2021 is a good starting point for understanding how effective Azerbaijan's policy is in promoting innovation in the country. Table **13** provides a ranking of the Global Innovation Index 2021 in relation to the performance of Azerbaijan (Global Economy, 2021).

Table 13. Global Innovation Index 2021 Ranking in Relation to the Performance of Azerbaijan.

Ranking in GII	Economy	Points	Ranking in Income Group	Regional Ranking	Income Level
80	Azerbaijan	28.4	24	14	below average

The latter figure for 2021 is 28.4. By comparison, the global average in 2021 for 132 countries is 34.30. Notably, the position of Azerbaijan on the global stage in matters related to innovation has been improving annually. Table **14** presents the GII ranking 2021 on a range of indicators related to innovation development in Azerbaijan (Global Economy, 2021).

Table **14** concludes that the economy of Azerbaijan is in the second quartile according to many indicators, suggesting that although the economy is developing, it is weak. Azerbaijan has high scores in two of the seven GII pillars: institutions and level of market development, which are above average for the upper-middle-income group. Azerbaijan ranks below average for its income group in five main areas: human capital and studies, infrastructure, business sophistication,

knowledge- and technology-based products, and products for creativity. Compared to other countries in North Africa and West Asia, Azerbaijan demonstrates: above average in two of the seven GII pillars: institutions and market development; and below average in five of the seven GII pillars:

Table 14. GII Ranking 2021 on a Range of Indicators Related to Innovation Development in Azerbaijan.

Country/Economy	Overall Rating in the GII	Institutions	Human Capital and Studies	Infrastructure	Level of Market Development	Level of Business Development	Results Obtained in the field of Knowledge and Technology	Results Obtained from Creative Activities
Azerbaijan	80	58	89	88	36	92	115	67
	2nd quartile	3rd quartile	2nd quartile	2nd quartile	3rd quartile	2nd quartile	1st quartile	2nd quartile

human capital and research, infrastructure, business sophistication, knowledge and technology, and creative outcomes. Furthermore, Azerbaijan performs best in terms of market development and weakest in terms of the level of knowledge and technological output. Table **15** presents the strengths and weaknesses of innovations in Azerbaijan in the GII for 2020 (Global Economy, 2021).

Table 15. Strengths and Weaknesses of Innovations in Azerbaijan in the GII for 2020.

Strengths			Weaknesses		
Code	Indicator name	Rank	Code	Indicator name	Rank
1.3	Business environment	33	2.1.1	Education expenditure, % of GDP	109
1.3.1	Ease of starting a business	9	2.3.3	Global R&D companies, top 3, million dollars USA	42
2.1.5	Ratio of students to teachers, secondary school	6	3.2	General infrastructure	120
4	Market sophistication	36	5.1.3	GERD carried out by businesses, % of GDP	88
4.1.1	Ease of obtaining loans	1	5.2.3	GERD funded from abroad, % of GDP	101
4.1.3	Gross microfinance loans, % of GDP	14	5.2.4	Transactions in joint ventures and strategic alliances/billion GDP in USD USA by PPP	109
5.2.1	Cooperation between university and industry in studies	23	5.3	Absorption of knowledge	119
5.2.2	The state of cluster development	29	5.3.1	Payments for intellectual property, % of total trade	105
5.3.4	Net FDI inflows, % of GDP	16	5.3.2	Imports of high-tech goods, % of total trade	121
6.3.4	Net FDI outflows, %	8	6	Results in the area of knowledge and	118

	of GDP			technology	
7.1.4	ICT and the creation of an organisational model	35	6.3.1	Proceeds from intellectual property, % of total trade	106
			7.2.5	Exports of creative goods, % of total trade	120
			7.3.4	Creation of mobile applications / billion GDP in dollars USA by PPP	97

Note: FDI – foreign direct investment; USA – United States of America; PPP – purchasing power parity; ICT – information and communication technologies.

The data in Table **15** shows that for many of the positions that relate to the strengths of Azerbaijan in the Global Innovation Index, the republic does not go beyond the top 40 countries. However, in terms of weaknesses, it is below 88th place for many indicators, with the only exception being Global R&D companies, top 3, million dollars. USA (42nd place). Table **16** presents the strengths and weaknesses of Azerbaijan in the GII for 2020 according to the seven GII pillars (Global Economy, 2021).

Table 16. Strengths and weaknesses of Azerbaijan in 2020 according to the seven pillars of the GII

Strengths	Weaknesses
Institutions (59): Business environment (33), Ease of starting a business (9)	Human capital and studies (89): Education expenditure (109) and Global research companies (42)
Human capital and studies (89): Ratio of students to teachers (6)	Infrastructure (85): General infrastructure (120)
Level of market development (36): Ease of getting a loan (1) and Microfinance, gross loans (14)	Business sophistication (96): Knowledge assimilation (119), GERD is driven by business (88), GERD is funded from abroad (101), JV – strategic alliance transactions (109), payments for intellectual property (105), and high technology imports (121)
Business sophistication (96): University-industry cooperation in studies (23), State of cluster development (29), and net FDI inflows (16)	Knowledge and technology outcomes (118): Proceeds from intellectual property (106)
Knowledge and technology outcomes (118): Net FDI outflows indicator (8)	Creative outcomes (65): Export of creative goods (120) and Mobile application, creation (97)
Creative outcomes (65): ICT and organisational model building (35), National feature films (27)	

Table **16** indicates that the strengths of the GII for Azerbaijan are found in six of the seven GII pillars, while the weaknesses of the GII for Azerbaijan are found in five of the seven GII components. R&D expenditure in Azerbaijan between 1996 and 2018 has a value of 0.18% in 2018, averaging 0.25% with a minimum of 0.17% in 2006, and a maximum of 0.42% in 1998. Information technology exports in Azerbaijan in 2019 were recorded at a level of 0.02%, with a minimum of 0% in 2008 and a maximum of 0.14% in 2000. The export of high technology (hi-tech), in Azerbaijan in 2020 was $36.52 million. The average value for Azerbaijan during 2007-2020 was $23.65 million, with a minimum of $4.54 million in 2009 and a maximum of $73.4 million in 2013. High-tech exports, the percentage of finished goods exports, in Azerbaijan was 4.35% in 2018. The average value for Azerbaijan during 2007-2018 was 4.63%, with a minimum of 1.02% in 2009 and a maximum of 13.78% in 2013. There were 147 patent applications from residents of Azerbaijan in 2019. The average value for Azerbaijan during 1995-2019 was 209 patent applications, with a minimum of 144 in 2012 and a maximum of 287 in 2007. To fully determine the position of Azerbaijan on the global stage in terms of innovation, it is also important to analyse the ranking of countries in the world according to the human development index. The development of any sphere of activity in any country in the world depends on human capital (Zeynalli, 2020). Table **17** presents data on the position of Azerbaijan in the World Human Development Index rankings for 2019 (Global Economy, 2021).

According to Table **17**, Azerbaijan is ranked 88th in the Human Development Index, indicating that more attention needs to be paid to the training and development of human resources. This should be done starting from high school and linking higher education institutions to the needs of the innovation economy and potential employers. The analysis of innovation development and innovation activities in Azerbaijan has highlighted the key areas of state innovation policy: the implementation of activities aimed at the development and improvement of the legal and regulatory framework for innovation-related activities and mechanisms to stimulate innovation; the implementation of activities aimed at the development of the state strategy focused on the innovative way of the country's economy development; provision of an opportunity to carry out coordinated activities of state bodies, economic and scientific organisations aimed at the innovative way of the country's development.

Priority areas in the economy of the Republic of Azerbaijan are: development of the national economy in general, through innovation; development of the oil and gas industry, through innovation; production and processing of agricultural products, through innovation; production of consumer goods at small and medium-sized enterprises (SME) level, through innovation; development of heavy industry and mechanical engineering, through innovation; development of the specialised tourism industry, through innovation; development of logistics and trade, through innovation; development of affordable housing provision, through innovation; development of vocational education and training, through innovation; development of financial services, through innovation; development of telecommunication and information technologies, through innovation; development of public

Table 17. Azerbaijan in the World Human Development Index Rankings for 2019.

Human Development Level			Gender Development Index		Gender Inequality Index		Multidimensional Poverty Index for 2008-2019			
level	rating	value	value	group	value	rating	value	number (%)	deprivation intensity (%)	year and survey
high	88	0.756	0.943	3	0.323	73	-	-	-	-

services (electricity, heat, water and gas) in the Republic of Azerbaijan, through the introduction of innovation (Abdurazzakov et al., 2020; Roshchupkina, 2020; Hernández-Ramírez et al., 2021). The Azerbaijan Foundation for Promotion of Export and Investment "AZPROMO" has developed a concept of 8 priority sectors of economic development in Azerbaijan: mining; digital economy; telecommunications; petrochemicals; construction; transport, trade and logistics; agriculture and food industry; tourism (Alekhina, 2020a; Abdurazzakov et al., 2020; Roshchupkina, 2020; Hernández-Ramírez et al., 2021). However, despite a number of positive factors related to the development of innovation activity in Azerbaijan, there are also negative ones, as reported by various innovation actors.

The analysis and the identified shortcomings resulted in recommendations, which are required to develop innovation activities and improve the process of interaction between the actors involved in innovations: to ensure the creation of an industry serving innovation; to ensure the formation of an intellectual property bank; to provide regular activities for the preparation of long-term scenario projections to update the national innovation strategy; to ensure an increase in the level of production performance and competitiveness of manufactured products through the formation/distribution of fundamental and enhancing innovations; to provide support for the level of innovation activity in a number of industries that can assist in the development of market relations; to ensure an increase in state support for innovation activities in a number of industries, improving the level of return on the implementation of state resources aimed at the development of small enterprise innovation activities; to ensure the development of credit and risk insurance for knowledge-intensive projects; to provide for the creation, preservation and development of human resources capacity in the innovation sector; to ensure the development of innovation infrastructure in small businesses.

Based on the findings of the study, it was concluded that the effect of increased motivation for innovations consists of the following components: reduced time to acquire new competencies (distraction from the work process to improve skills); combination of professions; increased work performance and possibly reduced staff turnover, due to improved understanding of the changes taking place and fewer people leaving their jobs for this reason. The analysis revealed that, according to the Global Innovation Index, Azerbaijan is in the middle position and ranks in the eighth ten. However, in terms of the strength of some indicators, it is in the top 40, while in others it ranks below 88th. In general, it can be concluded that the government is allocating sufficient funds for the development of innovation, but this is still not sufficient according to the estimates of various innovation actors.

4. CONCLUSIONS

Nowadays, innovation is considered to be one of the most important factors for the competitiveness of enterprises and regions for the development of any national economy. The changes that occur in a complex and unpredictable environment compel companies to constantly develop different ways of achieving an advantage over their competitors. One of these ways is to introduce innovations. An appropriately designed and effectively implemented innovation strategy is a source of increasing enterprise value and competitiveness in the market. Notably, innovation activities can encompass a range of research and development, technical, organisational, financial and commercial actions, the aim of which is to develop and implement new or substantially improved products or processes. Regardless of the scale of operations, the effective management of innovation processes is a significant element in increasing a company's competitiveness and ensuring its long-term sustainable development. Despite the numerous factors considered barriers to innovation in SMEs, their commercialisation is necessary as it enables a company to grow, adapt more quickly and productively to different changes, enter new markets and thereby achieve a competitive advantage. The need to meet the growing demands of consumers and increasing competition is prompting small and medium-sized enterprises to make changes in various areas of their operations. This includes activities that involve improvements in innovation management processes.

Innovation-related activities include the processes of developing, introducing new or upgrading existing products and services, technological processes, organisational systems. Innovation management can be defined as an institutional mechanism for the creation, development and promotion of new ideas and solutions. It involves the implementation of innovation activities on an ongoing basis, facilitating a rapid and flexible response to market challenges and changes. The innovation process consists of a number of different activities that are carried out according to a set order, enabling a specific innovative idea to be realised and transformed into new products and solutions. The stimulation of innovation-related activities by the government in Azerbaijan is of great strategic importance. In the future, it may allow the country to reach a new level of development, create new jobs, raise living standards, and improve the business climate in the country. The Government of Azerbaijan should ensure cooperation with international financial institutions to develop joint research and development in various fields of activity. The country's innovation policy is in line with current trends, as close attention is paid to the creation of new technologies. Furthermore, much attention is given to developing high-tech industries and increasing the contribution that public

research organisations make to innovation-related activities. Businesses working with innovation will gain access to new markets only by undertaking new product development. Innovations contribute to economic growth and create new jobs. This is why the government provides financial support to innovative enterprises. Thus, businesses can bring their innovative products and services to market more quickly and in demand.

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