REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

IMPROVING INNOVATIVE MANAGEMENT OF INDUSTRY IN THE REPUBLIC OF AZERBAIJAN

Specialty:	5306.01 – Economics of technological innovations
Field of science:	53 – Economy
Applicant:	**Orkhan Zahit Suleymanli**

Baku – 2025

The work was performed at the Scientific Research Institute of Economic of the Ministry of Economy of the Republic of Azerbaijan.

Scientific supervisor: Doctor of Sciences in Economic Sciences
Arzu Dogru Huseynova

Official opponents: Doctor of Sciences in Economic Sciences, Professor
Zakir Majid Najafov

Doctor of Philosophy in Economic Sciences, Docent
Murad Manaf Bagirzadeh

Doctor of Philosophy in Economic Sciences, Docent
Tayyar Ali Mustafayev

Dissertation Council ED 2.38 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan Technical University.

Sciences, Professor
Vilayat Mammad Valiyev

Scientific Secretary of the Dissertation Council:
Doctor of Philosophy in Economic Sciences, Docent
Fergana Gazanfar Musayeva

Chairman of the Scientific Seminar:
Doctor of Sciences in Economic Sciences, Professor
Alovsat Garaja Aliyev

GENERAL DESCRIPTION OF THE DISSERTATION

Actuality and development of the topic. In the Strategic Roadmap of the perspective of the national economy of the Republic of Azerbaijan, the increase of export-oriented production is defined as one of the main directions, and the application of innovative management in industrial enterprises has become particularly relevant. Based on our research, we can note that innovative management methods in the Azerbaijani industry have not been sufficiently studied in detail as a research object. Therefore, it is very important to study ways to improve innovative management in the Azerbaijani industry and determine the possibilities of application. The work of scientists in many countries of the world has been devoted to the investigation of innovative management issues in industrial enterprises. Among them, H.Aygören, J.Duran, N.Ozcher, V.Ozchiftchi, S.A.Ogarkov, U.P.Anisimov, A.N.Asaul, L.S.Baryutin, E.P.Garmashova, E.E.Brousseau, S.Casper, H.V.Chesbrough, C.M.Christensen and others can be mentioned [66, 67, 68, 69, 70, 72, 73, 75, 77, 87, 88, 89, 90]. At the national level, the works of many scientists such as T.N.Aliyev, R.T.Khumbatov, A.D.Huseynova, F.H.Gasimov, I.H.Gasimov, A.Kh.Nuriyev, A.H.Tagiyev have included the study of this field [30, 35, 36, 39, 41, 49, 64]. Although these scientists have studied the application of innovations in the field of industry from various aspects, they have not carried out a comprehensive study of the issue of innovative management of the industry. Therefore, at a time when the dynamic development of the industry is supported by the state, a comprehensive study of the issue is an objective necessity.

The object and suject of the research. The object of the research is the enterprises operating in the industrial parks and districts of the Republic of Azerbaijan, and the subject of the research is the methods of improving the innovative management of these enterprises and determining the factors that stimulate their effectiveness.

Goals and tasks of the research. The aim of the dissertation work is to study the theoretical and methodological bases of improving the innovative management of industry in Azerbaijan, to determine their application possibilities in industrial enterprises, and to prepare

important theoretical and practical recommendations for the improvement of innovative management.

In accordance with the purpose of the research, the following tasks were set in the dissertation work:

- Summarize theoretical views on the essence and content of innovative management in industry and express your attitude to these views.
- Investigating modern trends and application criteria of innovative management of industry and making proposals that will create positive changes for our country.
- To analyze the economic and legal mechanisms for the innovative management of the Azerbaijani industry and to determine the possibilities of their effective use.
- To compare the industrial potential of economic regions using the "localization factor" and "rating assessment" methods and evaluate the needs of innovative management of the Azerbaijani industry.
- To assess the effectiveness of management innovations by conducting statistical analyzes on innovations in the Azerbaijani industry and to determine the factors that hinder innovative development.
- Determining directions of control over the application of innovative management organization models in the industry across the country.
- Development of an innovative management model in the Azerbaijani industry.
- Preparation of proposals for ensuring the intensification of innovative processes in the Azerbaijani industry.

Methods of the research. The information base of the study is consist of the decrees and orders of the President of the Republic of Azerbaijan, various normative-legal documents and methodological resources, information of the Ministry of Economy and the State Statistics Committee, materials of the Economic Scientific Research Institute and scientific practical conferences, internet materials, information given in the periodical press, as well as the existing materials of a number of industrial enterprises, such as industrial parks and industrial districts under the management of the Economic Zones

Development Agency, the works of Azerbaijani and foreign scientists dedicated to innovative management, stimulation of innovations and evaluation of the efficiency of innovative development.

Research methods are analysis, synthesis, generalization, comparison and statistical analysis methods.

The main provisions of the defense. The main provisions of the dissertation submitted for defense are as follows:

- Taking into account the structure of Azerbaijan's industry and its position in international competition, determining the points that can give successful results in our country from the experiences of international technoparks and industrial parks [4, p.63-67; 5, p.114-118].
- Determining the priority directions for improving the position of our country in the Global Innovation Index [3, p.125-133].
- Evaluating the effectiveness of economic and legal mechanisms for innovative management of Azerbaijani industry [6, p.97-103].
- Determining the innovation law and the strategic approach to innovation development to ensure the innovative development of the industry [12]
- Assessment of the prospects of innovative development of industry in the liberated regions of our country [10, p.196-200]
- Assessment of industrial potential based on the new division of economic regions of Azerbaijan and identification of factors that slow down innovative development across the country with statistical analysis [7, p.38-46].
- Determining the role of lean production methods and the required organizational innovations in the innovative management of the industry [9, p.32-40; 11]

Scientific innovations of the research:

1. Ratings of Azerbaijan's economic regions according to industrial potential based on the new division were determined using the methods of rating assessment and localization coefficient.

2. Statistical analyzes of economic, production and other factors that hinder innovative development are carried out, insufficient funds, insufficient financial assistance from the state, high economic risk,

low innovation potential of the enterprise, high cost of innovations, legislation regulating and encouraging innovation activities and factors such as the lack of normative-legal documents were determined to be decisive and important.

3. Through regression analysis, it has been determined that, in the Republic of Azerbaijan, unlike process innovations, product innovations exhibit a positive correlation with the entire industry based on expenditures on technological innovations.

4. A new hybrid model has been identified for enterprises in industrial parks and districts based on innovative management models in industry and lean production methods.

Theoretical and practical significance of the research. The results obtained in the current dissertation work are aimed at improving innovative management in the Azerbaijani industry, therefore, justified proposals and recommendations can be used in the analysis and planning of industrial activity.

Approbation and application. The main theoretical propositions, conclusions, proposals of the dissertation were discussed at various scientific-practical conferences and scientific articles were published in scientific journals. **7** articles, including **1** article abroad, and **5** conference materials, including **1** conference material abroad, were published based on the general content of the dissertation work and scientifically verified proposals.

The name of the institution where the dissertation work was performed. The dissertation was completed at the Economic Scientific Research Institute of the Ministry of Economy of the Republic of Azerbaijan.

The structure of the dissertation. Dissertation title page – **1** page, table of contents – **1** page (1045 characters), introduction – **6** pages (10047 characters), 1st chapter **25** pages (48260 characters), 2nd chapter **57** pages (81978 characters), 3rd chapter consists of **29** pages (51912 characters), main results – **5** pages (9575 characters), **12** pages of the reference list of **122** names – **147** pages (236640 characters) in total. The total volume of the dissertation, excluding the **16** tables, **7** graphs and **3** pictures, bibliography and appendices used in the dissertation work is 201772 characters.

The content of the dissertation

MAIN CONTENT OF THE RESEARCH

In the introduction, the relevance of the topic is justified, the level of study of the problem, goals and tasks, the main propositions defended, theoretical and methodological bases, methods, scientific innovations and practical importance are indicated.

The essence of innovative management in industry, modern trends and application criteria of innovative management were investigated in the first chapter of the dissertation, which is called the theoretical-methodological basis of the organization of innovative management in industry. The main goal in the application of innovations in the industry is to achieve a continuous increase in productivity.

One of the evaluation tools used in the field of innovation is the Global Innovation Index, which is based on the calculation of the variables used by countries to achieve the target strategy. According to the indicators of 2023, Azerbaijan ranks 89th in this rating with 23.3 points. Considering the high potential of our country, this rating is not a good result, and unfortunately, Azerbaijan was the last among the countries of the South Caucasus. However, the positive thing here is that our country has advanced 4 steps compared to the result of 2022. So, if we look at the scores of our country on various parameters, it has the lowest scores among South Caucasus countries in areas such as knowledge creation, access to ICT, export of ICT services, industrial designs by origin, online creativity, github usage and mobile application creation. Taking these into account, it is necessary to develop a joint strategy with reputable international consulting companies and conduct purposeful activities on the indicators in order to increase the rating of our country in this index.[1]

In order to investigate innovative development at the international level, the technology park experience of developed countries should also be studied. Technoparks are considered as one of the important details of economic and technological progress in

[1] Suleymanli, O.Z. Global innovation index for performance ranking. The position of Azerbaijan // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2020. ISSN 1810-911X, - No. 1, - p. 125-133.

countries that have reached a high level of development. In order for Azerbaijan to rise as a country with a high level of industrial technological development, more importance should be given to the spread of technological parks. Many factors should always be in focus to increase efficiency in technology parks that have started to operate. Thus, there should be comprehensively developed infrastructure and scientific-research institutes in the regions where technoparks are located. International experience also confirms that state support and tax incentives play a more serious role in the first years of operation of technological parks. However, this support should not be spontaneous, but should be implemented through deep analysis, the formation of a transparent business environment, and the provision of low-interest loans to residents.[2]

In the second chapter, devoted to **the analysis of the current state of innovative management in the Azerbaijani industry**, the legal and economic mechanisms of innovative management, development directions were examined and the efficiency of management innovations was evaluated.

The decree on the approval of the "Model Regulation on Industrial Parks" was issued on April 24, 2013, by President Ilham Aliyev and serves as the legal foundation for regulating industrial parks.

In the Republic of Azerbaijan, residents of industrial parks are granted exemptions from property, land, and profit taxes for a period of 10 years. Additionally, machinery, technological equipment, and installations intended for use in production and imported into Azerbaijan are exempt from value-added tax (VAT) for 10 years and customs duties for 7 years. These tax incentives begin to apply from the date the enterprises are registered as residents of the industrial parks. According to the existing legislation in Azerbaijan, only land plots in industrial parks are leased for long-term use, and no specific benefits are provided for raw materials imported into the country. Machinery, technological equipment, and installations imported for

[2] Süleymanlı, O.Z. Sənaye parklarının inkişafının dünya təcrübəsi // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2020. - ISSN 1810-911X, - No. 3, - s. 114-118.

construction, research, experimental design, and future production purposes in industrial parks are exempt from VAT for 10 years from the date they are registered in the industrial park.[3]

Effective establishment of industrial enterprises in the regions should be carried out with a comprehensive assessment, taking into account the territorial location and strategic planning. Different rating evaluation methods can be used to compare the industrial potential of different regions in the Republic of Azerbaijan. The essence of the rating evaluation is based on the comparison of the evaluated object with its highest state. This methodology helps to concretely calculate the ranking of administrative regions for different years for different indicators. In this case, the mathematical function will be:

$$R_i^a = 1 + (n-1) * (A_{max} - A_i)/(A_{max} - A_{min})$$

Here, R_i^a is the rating of the i region on the A indicator, n is the number of economic regions for which the rating is to be calculated, A_{max} is the maximum value on the A indicator, A_i is the indicator itself, A_{min} is the minimum value on the A indicator. Then, to calculate the final rating for economic region i, the numerical average of the ratings calculated for various indicators is calculated as follows. Here, m is the number of indicators.

$$R_i^{total} = \left(R_i^a + R_i^b + \ldots + R_i^z\right)/m$$

A rating assessment was made for the period from 2013 to 2022 using the economic statistical data of the State Statistics Committee of the Republic of Azerbaijan. The industry statistics used for rating evaluation are shown below:

- Value of industrial products by regions at actual prices (thousand manats)
- The number of enterprises operating by region
- Number of private entrepreneurs registered to engage in

[3] Süleymanlı, O.Z. Azərbaycan sənaye parklarının innovativ idarə edilməsinin iqtisadi hüquqi mexanizmləri // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2021. - ISSN 1810-911X, - No. 2, - s. 97-103.

industrial activity (people)

- The specific weight of the non-state sector in the volume of industrial output by region (percentage)
- Loaded goods, (million manats)
- End-of-year balance of finished products stock (million manats)

Later, the rating evaluation method was applied using statistical values for regions, and a comparative analysis of Azerbaijan's industry by economic regions was carried out. The highest industrialization process in our republic belongs to Baku city and Absheron-Khizi economic region, and the lowest industrialized area belongs to Karabakh and East-Zangezur economic regions, which have been occupied for a long time. So, if we pay attention to the value of industrial products in actual prices by region, Baku city differs sharply from other regions. By applying the rating assessment method, rating calculations were performed among 13 other economic regions of the Republic of Azerbaijan, excluding Baku, and priority economic regions with higher potential for the establishment of industrial zones were determined. Since Baku city's industry indicators are generally the main part of the country's industry and are significantly higher than other economic regions, Baku city's indicators were not included in the calculations in order to see the difference between economic regions more clearly. As a result, according to the main indicators of the industry, it was determined that Absheron-Khizi, Ganja-Dashkasan and Nakhchivan economic regions have greater potential for the future development of the industry than other economic regions. The fact that the East-Zangezur and Karabakh economic regions were under the occupation of Armenia for a long time resulted in the collapse of the infrastructure there. After the victory in the Patriotic War, large infrastructural projects are needed for the resettlement of the population to our lands freed from occupation, as well as for the reconstruction of industry. Nagorno-Shirvan, Guba-Khachmaz and Lankaran-Astara economic regions have a low level of industrial potential. In the table below, 1 Absheron-Khizi, 2 Ganja-Dashkasan, 3 Gazakh-Tovuz, 4 Sheki-Zagatala, 5 Lankaran-Astara, 6 Guba-Khachmaz, 7 Central Aran, 8 Mil-Mugan, 9 Shirvan-Salyan, 10

Karabakh, 11 Shows information related to the economic regions of Eastern Zangezur, 12 Nagorno Shirvan, 13 Nakhchivan.

Table 1

"Rating Assessment" according to the industrial potential of Azerbaijan's economic regions for 2013-2022

Years	1	2	3	4	5	6	7	8	9	10	11	12	13
2013	4	6	9	8	9	9	8	9	7	11	13	11	5
2014	4	6	9	7	9	9	8	9	8	11	13	11	5
2015	4	6	9	8	9	10	9	9	9	11	13	11	5
2016	2	5	9	7	9	9	9	7	8	10	13	11	5
2017	2	6	9	7	9	10	8	8	8	10	13	11	6
2018	2	6	9	8	8	10	9	9	7	10	13	11	6
2019	2	6	9	8	9	10	9	9	9	10	13	11	8
2020	1	6	9	8	9	9	9	9	8	11	13	10	8
2021	2	8	10	9	9	10	10	9	9	11	12	11	9
2022	2	9	10	9	10	10	11	9	10	12	13	11	9

Source: Prepared by the author based on the data of the State Statistics Committee of the Republic of Azerbaijan.

Another methodology that can be used to assess the industrial potential of regions in the Republic of Azerbaijan is the "Localization coefficient" methodology. For the application of this methodology, indicators of total output and industrial output of other 13 economic regions, excluding Baku city, were taken as a basis. Since Baku city's industry indicators are generally the main part of the country's industry and are significantly higher than other economic regions, Baku city's indicators were not included in the calculations in order to see the difference between economic regions more clearly. The calculation of the localization coefficient is calculated by the following formula:

$$LQ = \left(Emp_{ig}/Emp_g\right)/(Emp_i/Emp)$$

Here, Emp_{ig} – shows the production output of i sector in economic region g, Emp_g – total production output in economic region g, Emp_i – total production output of i sector in the country, Emp – total

production output of the country. In the period from 2013 to 2022, the "Coefficient of Localization" was calculated for 13 economic regions based on the actual prices and values of output and industrial output in the main areas of the economy. When analyzing the results, it should be taken into account that the obtained values greater than 1 or close to 1 indicate the presence of high potential in the region for that area, and the value close to 0 indicates very low potential.

Thus, results similar to the rating assessment method were obtained with the localization coefficient method, and economic regions with greater potential in terms of the future development of industry, the expansion of parks and districts, as well as the establishment of new ones have been identified.

Then, based on the data of the State Statistics Committee, the factors affecting the innovative development of industrial enterprises in our country were statistically analyzed for the 15-year period from 2008 to 2022. Here, various economic, production and other factors were used for analysis and mainly the following statistical operations were carried out:

- The 95% statistical confidence interval of significance and important factors that hinder the implementation of innovations in industrial enterprises, as well as less important factors, was calculated.

- Alternative Hypothesis H_A: $\mu_{1>}\mu_2$ vs. Null Hypothesis H_0: $\mu_{1\leq}\mu_2$ was calculated and it was determined which of the economic, production and other factors are considered decisive and important.

The factors used for statistical analysis are listed below:

Economic factors:

- Lack of own funds
- Lack of financial assistance from the state
- Low paying demand for fresh products
- High value of innovations
- High economic risk
- Long payback periods for fresh products

Factors of production:

- Low innovation potential of the enterprise
- Lack of qualified workers
- Lack of information about new technologies

- Non-acceptance of innovations by enterprises
- Lack of information about sales markets
- Lack of opportunities for cooperation with other institutions and other scientific organizations

Other reasons:

- Lack of need for new products as a result of earlier innovations
- Absence of legislation and normative-legal documents regulating and encouraging innovation activity
- Indeterminacy of innovation process duration
- Lack of development of innovation infrastructure (mediation, information, legal, banking, etc. services).
- Lack of development of the technology market [4]

Then, t test was performed for decisive, important and less important factors that are an obstacle to innovative development, and the alternative hypothesis $H_A: \mu_1 \geq \mu_2$ versus the null hypothesis $H_0: \mu_1 < \mu_2$ was statistically analyzed. Here t value was calculated and confidence coefficient $\alpha=0.05$ was compared with t_α corresponding to n_1+n_2-2 degrees of freedom. The reliability coefficient of t_α is $\alpha=0.05$, and the value corresponding to the degree of freedom 15+15-2=28 is equal to 2.048.

$$t = (\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)/S_p * \sqrt{(1/n_1 + 1/n_2)}$$

$$S_p = \sqrt{(n_1 - 1) * S_1^2 + (n_2 - 1) * S_2^2}/(n_1 + n_2 - 2)$$

The S_p and t values obtained as a result of the calculation are given in Table 2.

[4] Suleymanli, O.Z. Statistical analysis of the factors impeding innovations in Azerbaijani Industry. // - Kiev: Scientific Journal of Science, Technologies, Innovations, - 2021. - ISSN 2520-6524, - No. 2 (18), - p. 38-46.

Table 2.

t test for factors that hinder innovative development in industrial enterprises

The number of enterprises that consider the following factors as obstacles to innovative development		Decisive and important		Little important			
	N	Average	Standard deviation	Average	Standard deviation	S_p	Calculated t value
Economic factors							
Lack of own funds	15	51.73	11.25	20.13	12.44	11.86	7.3
Lack of financial assistance from the state	15	28.67	10.58	17.93	3.13	7.8	3.77
Low solvency demand for fresh produce	15	24.33	7.67	20.2	9.73	8.76	1.29
High value of innovations	15	34.67	8.09	18.87	11.46	9.92	4.36
High economic risk	15	27.47	6.22	19	9.91	8.27	2.8
Long payback periods for fresh produce	15	22.47	10.25	27.47	8.81	9.56	-1.43
Factors of production							
Low innovation potential of the enterprise	15	33.07	8.53	17.27	9.27	8.91	4.86
Lack of qualified workers	15	19.07	6.8	24.87	6.38	6.59	-2.41
Lack of information about new technologies	15	22.07	8.22	18.6	4.48	6.62	1.44
Failure to adopt innovations by enterprises	15	17.27	6.63	19	7.14	6.89	-0.69
Lack of information about sales markets	15	16.73	6.77	18.07	7.77	7.29	-0.5

Table 2 continuation

Lack of opportunities for cooperation with other institutions and other scientific organizations	15	10.07	8.7	22.6	5.05	7.11	-4.83
Other reasons							
Lack of need for new products because of earlier innovations	15	13.87	7.65	21.07	12.22	10.19	-1.94
Lack of legislation and normative-legal documents regulating and encouraging innovation activity	15	20.87	6.6	15.53	6.73	6.67	2.19
Indeterminacy of innovation process duration	15	12.8	7.63	18.73	6.37	7.03	-2.31
Lack of development of innovation infrastructure (mediation, information, legal, banking, etc. services).	15	20.73	6.58	16.27	7.72	7.17	1.7
Lack of development of technology market	15	22.13	9.83	19.8	7.78	8.86	0.72

Source: Prepared by the author based on the data of the State Statistics Committee of the Republic of Azerbaijan.

Among the calculated t values, the null hypothesis is discarded and the alternative hypothesis is accepted in the statistical analysis for factors greater than 2.048 with a value of $t_{\alpha=0.05}$ for 28 degrees of freedom. The calculated t values are 7.3 in the factor of insufficient own funds, 3.77 in the factor of insufficient financial assistance from the state, 2.8 in the factor of high economic risk, 2.19 in the factor of lack of legislation and normative-legal documents regulating and encouraging innovation activity, and 4.86 in the factor of low innovation potential of the enterprise and in the factor of high value of innovations, it is equal to 4.36. Since the calculated results of these mentioned factors are greater than 2.048, the Alternative Hypothesis H_A: $\mu_1 \geq \mu_2$ is accepted and it is statistically proven that these factors are considered decisive and important by most enterprises. On the other hand, since the calculated t values for other factors in the table are smaller than 2.048, the alternative hypothesis is not accepted, and we cannot conclude that these factors are decisive and significant.

Thus, it is statistically proven that some of the above-mentioned economic, production and other factors that hinder innovative development by a large number of industrial enterprises are decisive and significant. Therefore, in order to ensure innovative development, it is recommended to enterprises in industrial parks and districts that they give more attention to the factors of high value of innovations, not having sufficient funds, insufficient financial assistance from the state, high economic risk, lack of legislation and normative-legal documents regulating and encouraging innovation activity, low innovation potential of the enterprise and these difficulties should be eliminated first.

Then, by conducting a simple linear regression analysis, the linear relationship between product innovations and industrial innovations as a whole was determined and the regression equation was calculated. Using the following formula, we calculate the correlation coefficient as r=0.92.

$$r = \sum (x - \bar{x}) * (y - \bar{y}) \Big/ \sqrt{\sum (x - \bar{x})^2 * \sum (y - \bar{y})^2}$$

Then the t test was performed and the alternative hypothesis H_A: $\rho \neq 0$ (Correlation exists) against the null hypothesis, H_0: $\rho=0$ (Correlation does not exist) was statistically analyzed. Here, the t value is calculated using the following formula:

$$t = r/\sqrt{(1-r^2)}/(n-2)$$

was calculated as 9.61 with the formula and $\alpha=0.05$ reliability coefficient was compared with t_α in the student t table corresponding to n-2 degrees of freedom. In the table, the reliability coefficient of $t_{\alpha/2}$ is $\alpha=0.025$, and the value corresponding to the degree of freedom 18-2=16 is equal to 2.12.

If $t>t_{0.025}$ or $t<-t_{0.025}$ H_0: $\rho=0$ (null hypothesis) is rejected and Alternative Hypothesis H_A: $\rho \neq 0$ is accepted. Otherwise, H_0: $\rho=0$ (null hypothesis) should be accepted. Here, since 9.61>2.12, the Alternative hypothesis H_A: $\rho \neq 0$ is accepted and it is confirmed that there is a correlation between these quantities. The alternative hypothesis H_A: $\rho^2>0$ versus the null hypothesis, H_0: $\rho^2=0$ was statistically analyzed by applying the F test for the coefficient of determination. Here F=(SSR/1)/(SSE/n-2) df degree of freedom is calculated based on ($D_1=1$, $D_2=n-2$) and $\alpha=0.05$ reliability coefficient, $D_1=1$, $D_2=n-2=18$ The value in the f table corresponding to 18-2=16 degrees of freedom is compared to 4.494. If the calculated f value is greater than $f_{0.05}(D_1=1, D_2=16)$, H_0: $\rho=0$ (null hypothesis) is rejected, otherwise H_0 $\rho=0$ (null hypothesis) is accepted. In the present case, since SSR=3796685452, SSE=657195920, and SST=4453881372, F=92.43 is calculated, and since $F=92.43>f_{0.05}(D_1=1, D_2=16)=4.494$, the alternative hypothesis H_A: $\rho^2>0$ is accepted. This means that it is statistically proven that the independent variable explains a large part of the dependent variable.

Then, we calculate the correlation coefficient as r=0.43, based on the statistical calculations of the costs of technological innovations for all industrial and process innovations. t test is performed and the alternative hypothesis H_A: $\rho \neq 0$ (Correlation exists) versus the null

hypothesis, H_0: $\rho=0$ (Correlation does not exist) is statistically analyzed. Here, the t value was calculated as 1.89 and the confidence coefficient $\alpha=0.05$ was compared with t_α in the student t table corresponding to n-2 degrees of freedom. In the table, the reliability coefficient of $t_{\alpha/2}$ is $\alpha=0.025$, and the value corresponding to the degree of freedom 18-2=16 is equal to 2.12. If $t>t_{0.025}$ or $t<-t_{0.025}$ H_0: $\rho=0$ (null hypothesis) is rejected and Alternative Hypothesis H_A: $\rho\neq0$ is accepted. Otherwise, H_0: $\rho=0$ (null hypothesis) should be accepted. Here, since $1.89<2.12$, H_0: $\rho=0$ (null hypothesis) is accepted and it is statistically confirmed that there is no correlation between these quantities. The alternative hypothesis H_A: $\rho^2>0$ versus the null hypothesis, H_0: $\rho^2=0$ was statistically analyzed by applying the F test for the coefficient of determination. Here F=(SSR/1)/(SSE/n-2) df degree of freedom is calculated based on ($D_1=1$, $D_2=n-2$) and $\alpha=0.05$ reliability coefficient, $D_1=1$, $D_2=n-2=18$ The value in the f table corresponding to 18-2=16 degrees of freedom is compared to 4.494. If the calculated f value is greater than $f_{0.05}(D_1=1, D_2=16)$, H_0: $\rho=0$ (null hypothesis) is rejected, otherwise H_0: $\rho=0$ (null hypothesis) is accepted. In the present case, since SSR=819152850, SSE=3634650483, and SST=4453803333, F=3.606 is calculated, and since $F=3.606< f_{0.05}(D_1=1, D_2=16)=4.494$, the null hypothesis H_0: $\rho^2=0$ is accepted. This means that we cannot statistically prove that the independent variable explains a large part of the dependent variable.

In the third chapter of the dissertation work, which is called the formation of priorities and application of innovative management in the Azerbaijani industry, the innovative management model for the Azerbaijani industry was formed by examining the organization models of the innovative management of the industry and the control directions of their application. It was recommended to allocate venture capital as a financial mechanism for promising and risky activities of new small companies and start-ups based on scientific and technical innovations. The importance of realizing venture capital to newly created innovative industrial enterprises not only by investors in the form of private investment, but also by the investments of state institutions. It was advised that investors

operating in traditional business fields in our country should create venture companies and venture funds and encourage the innovative development of the industry in a more organized manner. Such venture funds can help in the development of innovation infrastructure, optimization of the business sphere, inviting foreign investors to Azerbaijan, and even the operation of local projects in foreign countries. It was also recommended to expand relations between industrial enterprises and give preference to purchasing raw materials, spare parts and other products from other residents of industrial parks.

On the basis of various innovative management models, a hybrid model was proposed for the enterprises in industrial parks and districts of our country, taking into account the scope and structure of enterprises. In this model, taking into account the continuous development and changing conditions, agile management, lean manufacturing, neuromanagement, facilitator managment, manager-coach guided performance management, open innovation model, disruptive innovation model, and the symbiotic use of management according to the needs are envisaged. Thus, continuous communication with customers, flexible response to changes, quick adaptation to a changing environment, cost reduction through cost-effective methods, elimination of unprofitable activities, reduction of stress in the work environment, stimulation of creativity, creation of team spirit and coordination between employees, not just by directive methods, are the main features of this model.

In the hybrid model of innovative management of industry, the application of various elements from lean production methods in accordance with the field of activity of industrial enterprises is envisaged. By using the features of Kanban, "5S", kaizen and other methods, it is planned to create more favorable working conditions and minimize production losses in industrial enterprises. Thus, with kanban signal cards, information about products and spare parts is transferred between processes. With the full-time production method, the necessary measures are taken immediately, taking into account the amount and time of demand. Here, excess production and warehouse stocks are treated as waste, and full-time production methods eliminate

warehouse space limitations, unplanned raw material supply, and production bottlenecks. With kaizen methods, wasteful activities are removed over time with continuous improvement measures in industrial enterprises, and functionality is increased with labeling and visual control measures. The tagging method, in its simplest form, provides employees with faster access to the necessary tools and helps to significantly reduce time wastage. These types of measures make a positive contribution to the health and safety of workers in industrial enterprises.[5]

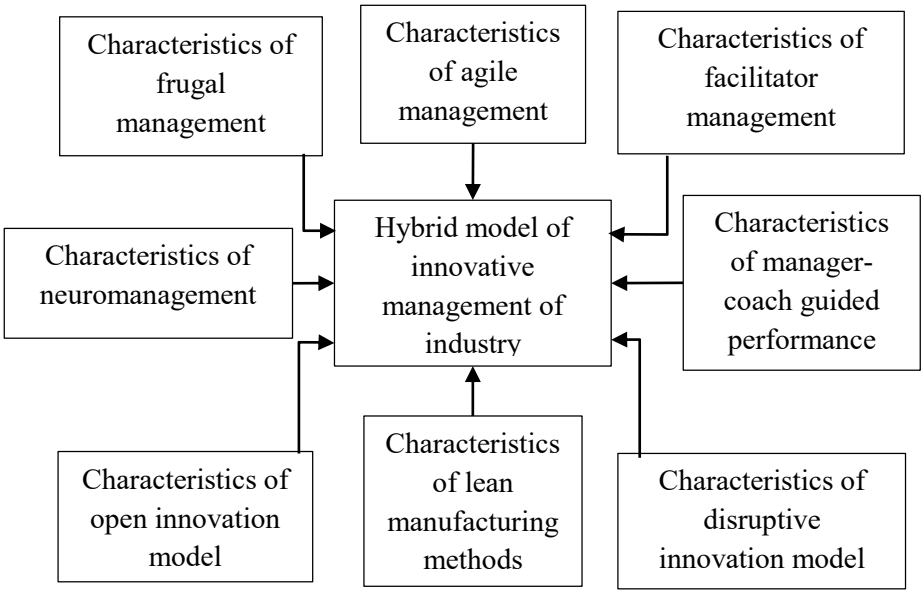

Figure 1. Hybrid model of innovative management of industry
Source: Prepared by the author

One of the important issues here is to form relations between the production team and customers in accordance with the principles

[5] Süleymanlı, O.Z. Sənayenin innovativ inkişafında qənaətli istehsal metodlarının tətbiqi // – Naxçıvan: Naxçıvan Universitetinin Elmi Əsərlər Jurnalı, - 2022. - ISSN 2616-4248, - No. 4 (28), - s. 32-40.

of agile management. Such relationships can exist in an environment where staff are not afraid to make mistakes, share knowledge and skills. One of the important factors to accept is that the system as a whole is greater than the sum of its individual parts, so coordination that forms an effective unity must be formed. Accomplished work is considered as the work of the team as a whole, not of individuals. In the hybrid model of innovative management of the industry, priority is given to independent decisions of teams formed directly by themselves, rather than top-down micro-management. Such engineering production groups can divide work among themselves.[6]

An important feature of the recommended model is the realization of the scope of production in small time intervals, taking into account priorities within limited time and resources. Here, it is intended to achieve customer satisfaction by early and continuous delivery of working parts of products to customers. In this model, while developing services and products, a partial solution with iterations divided into certain time intervals is mentioned. Constant communication with buyers and receiving suggestions and complaints from them is considered a positive thing. Even at the last stages, it is recommended to accept customer complaints and take appropriate measures. Another important issue is to implement planning operations adaptively at different levels, taking into account continuous changes. In the hybrid model of industrial management, it is taken into account that the given plan can be constantly changed, and the amount of planning in general is greater than in traditional methods. However, the issue here is that as the work progresses to the next stages, the accuracy of the given plans increases and the risk of incorrect planning decreases.

In this model, the characteristics of open and disruptive innovations is also considered in the application of innovations. Thus, with changes to digital technologies, business models and processes,

[6] Süleymanlı, O.Z. Sənayenin idarə olunmasında təşkilati innovasiyaların rolu. // "Dördüncü sənaye inqilabı dövründə elm və texnologiyaların mövcud vəziyyəti və inkişaf perspektivləri". // Beynəlxalq Elmi-Praktik Konfrans, - Gəncə: Azərbaycan Texnologiya Universiteti, - 6-7 May, - 2024, - s. 211-213.

new and modern solutions are created in the existing ecosystem. By creating new dynamics, it causes changes in the traditional experience of ecosystem subjects. Also, the active use of external resources was also noted in the implementation of organizational innovations, instead of just depending on their own internal resources. In this way, certain risks are shared, and management issues are viewed from different perspectives. Thus, the wide flow of ideas obtained from the external environment creates an additional opportunity to focus on strategic goals.

As these methods aim at the economical use of raw materials and other resources, they contribute to the prevention of pollution by reducing emissions and have a positive impact on the environment. Therefore, we can note that there is a positive correlation between lean production and green production.

Although the modern industry uses artificial intelligence, data analysis, robotics, cloud technologies, etc. equipped with, digitized and automated, there is still a need for human intervention in certain parts. In such cases, cost-effective production methods come to the fore and become an integral part of the modern digitized industry. However, in our proposed hybrid model, taking into account the new trends in the industry and the digitization factor, certain innovations and changes in cost-effective production methods have also been taken into account. So, instead of traditional kanban cards, it is recommended to use kanban cards in electronic form, and the value flow map method performed on paper to be organized in electronic form, and other such changes are recommended. Figuratively speaking, lean production methods create synergy with modern digitized industry. A digitized supply chain integrates lean production methods with full-time manufacturing and helps manage raw materials, supplies, and warehouse inventory with accurate, timely information. Universal maintenance of equipment, which is another lean production method, is directly related to the concepts of virtual reality and artificial intelligence of modern industry. Thus, it is possible to successfully apply the universal maintenance method by using the possibilities of virtual reality (direction of instructions to the monitor helmet, statistical analysis of equipment downtimes, etc.).

Another lean manufacturing method, value stream mapping, is related to the Internet of Things. Thus, the method of value stream mapping, based on the identification and elimination of waste in production processes, works even more effectively with the help of Internet of Things technology to obtain accurate information in real-time flow.

Our proposed hybrid model includes principles such as reducing waste in production, better visual organization, and reducing the duration and number of downtimes. At the same time, the use of large databases is based on the integration of systems such as cloud technologies and virtual reality. Thus, digitization will help industrialists achieve more perfect results by using cost-effective production methods. In the hybrid model, lean production methods are applied in different forms at different times, with workers focusing on value-adding operations and eliminating waste. These coordinated systems analyze data to predict outages and adapt to changes. Continuous application of lean manufacturing methods leads to continuous improvement, high quality and customer satisfaction.

CONCLUSION

The following results were obtained in the dissertation work:

The increase of innovation-based activities enables the formation of industries based on high technologies. Although the systematic and continuous support of the state in the Azerbaijani industry has a positive effect on innovative activity, the desired results have not yet been achieved.

Taking all this into account, the following important results were obtained:

1) The level of development of technological parks has been evaluated and the cases that can be applied to our country include the strengthening of the promotion of foreign investments, the involvement of state aid and tax incentives on the basis of experiences of the United States, Great Britain, Japan, South Korea and other developed countries in the innovative management of the industry [5].

2) It has been concluded that the development of an innovation strategy aimed at technological advancement plays a significant role in shaping an innovative management model in the industry of our country [12].

3) Based on statistical data collected by the State Statistics Committee of the Republic of Azerbaijan from 2013 to 2022, ranking assessments were conducted for economic regions, excluding Baku city. It was determined that, after Baku, the Absheron-Khizi, Ganja-Dashkasan, and Nakhchivan regions stand out among Azerbaijan's economic regions in terms of industrial potential. Subsequently, the "Localization Coefficient" was calculated for the other economic regions excluding Baku, yielding results similar to those of the ranking assessment method. Thus, the economic regions with higher coefficient values are identified as having greater commercial potential for the future expansion of existing industrial parks and zones, as well as the establishment of new ones.

4) A comparative analysis of industrial enterprises in our country according to the type of activity and ownership, their number, the value of the manufactured product, the number of salaried employees and the nominal salary was carried out. Taking these into account, it was recommended that in order to achieve high results in a shorter period of time across the country, importance should be given to the development of non-state enterprises operating in the processing industry in particular, and the factors that hinder innovation should be eliminated. After the statistical analyzes in the analysis of the economic regions of Azerbaijan according to their industrial potential and the analysis of the activity of the industry in Azerbaijan, in order to ensure innovative development, it was recommended to ensure the exchange of information about qualified personnel and modern technologies, to allocate a significant amount of funding from the state, and to expand the opportunities for joint activities with scientific organizations. The priority should be given to the preparation of legislative and normative-legal documents regulating and encouraging innovation activity and the formation of innovation infrastructure [6, 10].

5) Factors such as lack of own funds, lack of sufficient financial assistance from the state, high economic risk, low innovation potential of the enterprise, and high cost of innovations have been proved to be decisive and important factors that hinder innovative development. Therefore, it is recommended that enterprises in industrial parks and districts prioritize addressing these factors and focus on overcoming these challenges to ensure innovative development [7].

6) Statistical calculations of technological innovation expenditures for the years 2005-2022 for the industry of our country were carried out, and it was determined that there is a positive correlation, that the independent variable explains a large part of the dependent variable. The correlation was not proven in the statistical calculations and hypothesis analysis of process innovations for the Azerbaijani industry. Therefore, it has been concluded that, to achieve higher results in enterprises located in industrial parks and districts, greater attention should be paid to product innovations compared to process innovations.

7) The following ways are indicated for the development of manufacturing enterprises in Azerbaijan and for increasing the export of industrial products:

- Encouraging private entrepreneurship and start-ups for the development of competitive industrial production based on innovation and high technologies in our republic, attracting foreign investments, establishing joint ventures with transnational ICT companies, eliminating bureaucratic obstacles in the import and export processes of high-tech products, customs concessions, establishment of favorable conditions with a number of measures such as the application of international experience in our country
- Providing state support to the activities of independent entrepreneurs in this field with business training, infrastructure opportunities, preferential loans, business incubators
- Achieving sustainable development using the experience of developed countries and modern trends in the non-oil sector of industry
- Increasing employment in the processing sector of the industry and combating unemployment [3, 4]

8) Hybrid based on continuous contact with customers, flexible response to changes, quick adaptation to a changing environment, cost-effective methods, elimination of unprofitable activities, reduction of stress in the work environment, stimulation of creativity and continuous use of lean production methods depending on the field of activity and structure of enterprises in Azerbaijan's industrial parks and districts is highlighted [9, 11].

9) In order to ensure the intensification of innovative processes in the industry, the need for direct state intervention and the application of the experience of developed countries was stated [1,2,8].

The main content of the dissertation is reflected in the following published works.

1. Suleymanli, O.Z. Digital transformation for market acquisition. // "XVIII International Scientific and Practical Conference "Building of Information Society: Resources and Technologies" – Kiev: Ukrainian Institute of Scientific and Technical Expertise and Information, - 19-20 September, - 2019, – p. 145-153
2. Suleymanli, O.Z. Data analysis applications in modern world. // İqtisadi və statistik tədqiqatlarda innovasiyaların tətbiqi mövzusunda elmi-praktiki konfrans. - Bakı: Elmi-Tətqiqat və Statistik İnnovasiyalar Mərkəzi, - 22 Noyabr, 2019, – p. 120-122
3. Suleymanli, O.Z. Global innovation index for performance ranking. The position of Azerbaijan // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2020. ISSN 1810-911X, - No. 1, - p. 125-133.
4. Suleymanli, O.Z. Enhancing position of Azerbaijan in the world of petrochemicals business with innovative expansion of Industrial Parks// - Baku: Azerbaijan Oil Industry Scientific-Technical and Production Journal, - 2020. ISSN 0365-8554, - No. 6, - p. 63-67.

5. Süleymanlı, O.Z. Sənaye parklarının inkişafının dünya təcrübəsi // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2020. - ISSN 1810-911X, - No. 3, - s. 114-118.
6. Süleymanlı, O.Z. Azərbaycan sənaye parklarının innovativ idarə edilməsinin iqtisadi hüquqi mexanizmləri // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2021. - ISSN 1810-911X, - No. 2, - s. 97-103.
7. Suleymanli, O.Z. Statistical analysis of the factors impeding innovations in Azerbaijani Industry. // - Kiev: Scientific Journal of Science, Technologies, Innovations, - 2021. - ISSN 2520-6524, - No. 2 (18), - p. 38-46.
8. Suleymanli, O.Z. Innovative approach to business models in modern industry. // 2nd International Conference Digital Economy: Modern challenges and real opportunities, - Baku: UNEC, - 28-29 April, - 2022, – p. 225-228.
9. Süleymanlı, O.Z. Sənayenin innovativ inkişafında qənaətli istehsal metodlarının tətbiqi // – Naxçıvan: Naxçıvan Universitetinin Elmi Əsərlər Jurnalı, - 2022. - ISSN 2616-4248, - No. 3 (28), - s. 32-40.
10. Süleymanlı, O.Z. Azərbaycanın işğaldan azad olunmuş ərazilərində sənayenin innovativ inkişafı perspektivləri. // Beynəlxalq İpək Yolu və Naxçıvan. Beynəlxalq elmi konfrans, - Naxçıvan: Naxçıvan Universiteti, - 22-23 Noyabr, - 2022, - s. 196-200.
11. Süleymanlı, O.Z. Sənayenin idarə olunmasında təşkilati innovasiyaların rolu. // "Dördüncü sənaye inqilabı dövründə elm və texnologiyaların mövcud vəziyyəti və inkişaf perspektivləri". // Beynəlxalq Elmi-Praktik Konfrans, - Gəncə: Azərbaycan Texnologiya Universiteti, - 6-7 May, - 2024, - s. 211-213.
12. Süleymanlı, O.Z. İnnovasiya: Azərbaycan sənayesinin inkişafının açarı // - Bakı: Azərbaycan Universitetinin Elmi Jurnalı İpək Yolu, - 2024. - ISSN 1810-911X, - No. 3, - s. 69-74.

The defense will be held on 20 February 2025 at 14:00 Dissertation Council of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan Technical University.

Address: 25, H. Javid Avenue, AZ 1073, Baku, Azerbaijan.

The dissertation is accessible at the library of Azerbaijan Technical University.

Electronic versions of dissertation and its abstract are available on the official website of the Azerbaijan Technical University www.aztu.edu.az

Abstract was sent to the required addresses on 11 january 2025.

Signed of print: 08.01.2025

Paper format: A5

Volume: 39747

Number of hard copies: 20