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DETERMINANTS OF THE INFLUENCE OF INNOVATION ON SUSTAINABLE STATE DEVELOPMENT: ASPECTS OF PUBLIC ADMINISTRATION

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ABSTRACT

This paper to identify the importance of the impact of innovation on the sustainable development of states and the classification of sustainable development innovations. Design/Methodology/Approach: classification, grouping for classification innovations, analytical economic method to explore innovative development in EU countries; correlation-regression analysis. The study found that the concept of sustainable development, which is implemented to meet the needs of society, taking into account and counteracting the negative environmental impacts and based on the balance of the socio-ecological-economic system, is also oriented towards growth. Such growth can also be achieved through innovation. The main

factors of influence of innovations on the sustainable development of the country are identified. Measures have been developed to help manage innovation and achieve sustainable development goals. With this article we show that in order to stimulate innovative sustainable development, it is necessary to develop and adopt an innovative strategy, simplify the procedures for obtaining patents and licenses, stimulate research and increase the financing of innovation.

Keywords: Socio-ecological-economic development, Economic competitiveness, Eco innovations.

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1. INTRODUCTION

The holistic basis of social development involves the transition to innovative models of development as one of the most fundamental goals of the modernization process. However, the achievement of this is possible under the conditions of effective public administration and aimed at achieving the sustainable development of the state, which is reflected in the Sustainable Development Goals – 2030 [1]. Achieving sustainable development is determined by complicated and complex goals: overcoming poverty, increasing production efficiency, ensuring gender equality, overcoming negative environmental phenomena on the planet, and promoting cross-border cooperation [1]. All of this is aimed at meeting the needs of society without harming future generations [2].

Trends in the active transition of the world community to innovative ways of economic development, which provides for a major share of GDP through the production of high-tech products, can significantly increase the achievement of the goals of sustainable development of countries, their individual territories through the introduction of innovative technologies. In particular, technological innovations in the field of energy saving, greening production, saving the planet's resources can create a synergistic effect to achieve the goals of sustainable development.

2. LITERATURE REVIEW

Sustainable development trends, initiated at the end of the twentieth century, suggest a balanced development of society at the level of social, environmental and economic growth. That is, the essence of sustainable development lies in balancing societal needs and opportunities through a single socio-ecological-economic system. The goal of innovation is not only to achieve economic benefits, but also to social change, which determines the innovation potential and their implications for environmental and social stability [3]. Many scientists agree that enhanced social efficiency is only achieved through innovation [4].

Sustainable innovation is a modern phenomenon, but its development and implementation is as complex, dynamic and uncertain as other innovations [5].

According to [6], the use of technological innovation is an important prerequisite for sustainable development. It's not about manipulating technology, it's about trying to foster options. Since the 1990s, industrial ecology has been introduced as a view aimed at improving the environmental performance of technological systems [6].

Author in [7] defines sustainable innovations as, innovations (new technologies, models and models), the implementation of which leads to the solution of any of the problems of

sustainable development. Eco-innovation can be a separate subspecies of sustainable innovation [7].

In [8] author states that the difference between sustainable innovation and all other types of innovation can be: 1. increased complexity compared to traditional innovations; 2. sustainable innovation leads to significant and more revolutionary change; 3. greater interaction between companies, government agencies and the public is needed to deliver sustainable innovation [8].

According to [9], steel innovations are distributed across types of sustainable development. The authors highlight: economic changes; social change; environmental change.

Then, in [4] authors are distinguished by the following innovation that fosters sustainable development groups: traditional innovation; green innovation; social innovation; sustainable innovation. Researchers in [10, 11] emphasize that traditional innovations (economic innovations) take into account only economic indicators (increase in productivity, profitability, profitability) and are much less focused on environmental and other risks.

Sustainable innovation is often identified with ecoinnovations or green innovations, however, they are different types of innovation. One of the important issues for sustainable innovation is environmental issues and eco-innovation.

Author in [6] looks at innovation to achieve sustainable development through an environmental lens. That is, technologies that contribute to energy efficiency and reduce the negative impact on the environment or technologies that, by their operation, enhance environmental potential [6].

Scientists focus on a large number of environmental issues: a significant reduction in the use of non-renewable natural and energy resources and investment in renewable resource production systems, reduction of environmental pollution and emissions [12-15]. In [16] is emphasized the relevance of investments in electrical transportation of various types, processing of waste, including waste from plastic, active use of solar energy. In [17], author emphasizes that the main task of eco-innovation is to reduce environmental pollution and recycle waste. Also, is emphasized the features of eco-innovation, such as their increased risk of global application, the ability to influence productivity gains and cost savings [17].

Thus, researcher in [18] argues, that climate change is responsible for a wide range of impacts, such as rising sea levels, ocean acidification, droughts, glacier melting, and increasing the frequency of such extreme weather events as heat waves, floods, storms and hurricanes. In addition to these dire consequences, Authors in [19] also argue that climate change affects crop productivity and has adverse effects on the availability of food that could potentially interrupt food chains and counteract the progressive elimination of hunger in the world.

According to [20], the introduction of eco-innovations is influenced by: economic growth of the state/region (increase in gross production, growth of economic capacities), development of production technologies (quality of production), availability of skilled personnel, favorable mechanisms of state regulations (environmental law, licenses and certificates), market development (competition in the innovation market, in energy), laws and regulations, see figure 1.

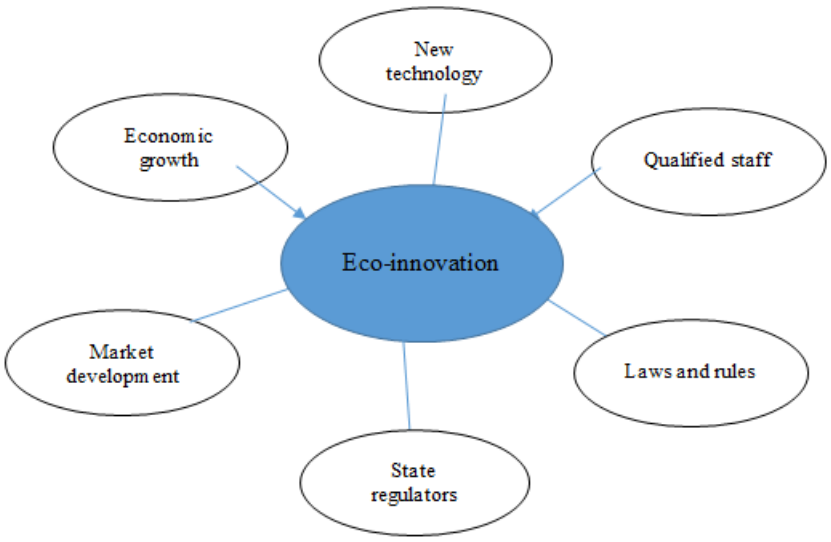

Figure 1. Factors influencing eco-innovation [20]

Social innovations and Sustainable innovations should be singled out. Social innovations are the ones that help accelerate the solution of social problems [21, 22]. The goal of social innovation is to satisfy the interests of society and improve the quality of life.

According to [23], sustainable innovations are the type of innovations is synonymous with "sustainability-oriented innovation". These innovations make it possible to transform values and concepts in society and are oriented towards the achievement of socially-oriented and environmentally-oriented goals. The innovation implementation model has three interrelated phases: Phase I. Implementation of simple single technological or product innovations aimed at eliminating negative environmental impacts. Phase II. Implementation and systematic implementation of such innovations at the corporate level. Phase III. Systemic changes in values and approaches to achieve sustainable development.

Therefore, sustainable innovations are innovations related to the socio-ecological and economic development of corporations, territories, bring about significant environmental and social changes, and serve to improve the quality of life of people.

3. METHODOLOGY AND DATA

Methods of research: analytical and economic method - in the analysis of theoretical and methodological bases of the problem study; method of comparative analysis - in the analysis of economic indicators; methods of generalization, systematization, synthesis, study of phenomena and processes in their development and interconnections, comparison, analogies, classification, grouping, etc. Correlation analysis was used to determine the statistical relationship between the indicators. The main purpose of the analysis was to identify the impact of various factors, including information security, on the formation of the image of states. The main indicators for correlation analysis are the following: The Global Competitiveness Index; Index Sustainable development; Global Innovation Index; Innovation Input Sub-Index; Innovation Output Sub-Index; Share of government budget appropriations or outlays on research and development; Research and development expenditure, by sectors of performance; Intramural R&D expenditure (GERD) by source of funds; Research and development personnel, by sectors of performance; High-tech exports; Patent applications to the European patent office (EPO) by priority year; Percentage of the ICT sector on GDP.

The countries of Europe (7 countries) were selected for the study: France, Germany, Estonia, Poland, Spain, Ukraine, United Kingdom.

4. RESULTS

At present, the EU is showing the best results in implementing the concept of sustainable development, despite the fact that problems related to sustainable development have become secondary to most countries after 2008, due to the onset of the global financial and economic crisis, worsened economic performance and increased financial volatility markets.

The top ten high-income countries, which provide the lowest percentage of ODA as a percentage of gross national income, consist largely of EU Member States (Cyprus, Latvia, Slovakia, Poland, Greece, Spain, Czech Republic and Hungary). EU countries also receive high praise when it comes to tax highs (leading positions on the UK, Cyprus and Ireland), financial secrecy and arms exports. In view of the foregoing, the 2017 SDG EU report [24] concludes that high-income countries (including several EU countries) are a source of significant environmental, economic and safety implications, while other countries are far behind in achieving the SDG goals (Table 1).

Table 1. Dynamics of the Global Economic Competitiveness Index and Sustainable Development of European Countries in 2015-2017 [24-29]

Country	Index of economic competitiveness			Sustainable Development Index			Absolute deviation 2017 from 2015, +/-	
	2015	2016	2017	2015	2016	2017	I	I
I. Western European countries, including:								
Germany	5,49	5,53	5,57	70,8	80,5	81,7	0,08	10,9
France	5,08	2,13	5,20	69,4	77,9	80,3	0,12	10,9
United Kingdom	5,41	5,43	5,49	68,3	78,1	78,3	0,08	10
Spain	4,55	4,59	4,68	66,5	72,2	76,8	0,13	10,3
II. Central European countries, including:								
Bulgaria	4,37	4,32	4,44	-	71,8	72,5	0,07	72,5
Hungary	4,28	4,25	4,20	55,5	73,4	78,0	-0,08	22,47
Poland	4,48	4,49	4,56	64,2	69,8	75,8	0,08	11,6
Ukraine	4,14	4,03	4,00	-	66,4	72,7	-0,14	72,7
III. Eastern European countries, including:								
Latvia	4,50	4,45	4,45	-	72,5	75,2	-0,05	75,2
Lithuania	4,51	4,55	4,60	-	72,1	73,6	0,09	73,6
Estonia	4,71	4,74	4,78	-	74,5	78,6	0,07	78,6

As it can be seen, during 2015-2017, the growth of The Global Competitiveness Index and the Sustainable Development Index is observed in all Western European countries, however, the Central European and Eastern European countries are significantly behind these indexes relative to the Western European countries. Thus, these figures increased in Germany – by 0,08 and 10,9 respectively, in France – by 0,12 and 10,9 respectively, in the UK – by 0,08 and 10 respectively, in Spain – by 0,13 and 10,3 respectively. For Central and Eastern Europe, The Global Competitiveness Index increased by 0,07 in Bulgaria, Poland by 0,08, Lithuania by 0,09 and Estonia by 0,07. In turn, Index Sustainable development increased in all Central and Eastern European countries, including in Bulgaria – by 72,5, in Hungary – by 22,47, in Poland – by 11,6, in Ukraine – by 72,7, in Latvia – by 75,2%, in Lithuania – by 73,6%, and in Estonia – by 78,6%. In some CEE countries, there is an increase in sustainable development, but a worsening of economic development (Latvia, Hungary, Ukraine). Since 2011, the average value of the EU innovation parameter has increased by 8.8 percentage points.

It should also be noted that countries with high economic development are more at risk of biodiversity loss, high emissions into the atmosphere and water. And only the introduction of innovations can support the economic growth and achievement of the SDG-2030.

Since 2011, the European Union has been characterized by the fact that innovation in its 25 Member States has increased. Sweden has the leading position in the respective direction for 2019. It ranks Finland, Denmark and the Netherlands. Lithuania, Greece, Latvia, Malta, the United Kingdom, Estonia and the Netherlands have the highest rates of attracting innovative ideas [30]. The Global Innovation Index during this period increased in most countries of Western and Central Europe, including Germany – by 1.34, in France – by 0.59, in Bulgaria – by 0.68, and in Poland – by 1.83, and in Ukraine – by 1.17 (Table 2).

Table 2. Dynamics of the Global Innovation Index of European Countries in 2015-2017 [27-29]

Country	Global Innovation Index			Innovation Input Sub-Index			Innovation Output Sub-Index			Absolute deviation 2017 from 2015, +/-		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	1	2	3
I. Western European countries, including:												
Germany	57,05	57,94	58,39	60,99	61,91	63,33	53,11	53,97	53,46	1,34	0,68	-11,13
France	53,59	54,04	54,18	61,25	62,56	63,41	45,93	45,51	44,94	0,59	-1,26	-3,77
United Kingdom	62,42	61,93	60,89	67,15	67,50	68,25	57,70	56,35	53,52	-1,53	1,83	-14,36
Spain	49,07	49,19	48,81	57,00	57,26	57,28	41,14	41,11	40,34	-0,26	1,17	-3,49
II. Central European countries, including:												
Bulgaria	42,16	49,19	42,84	46,10	45,30	47,61	38,23	37,53	38,08	0,68	1,51	-0,15
Hungary	43,00	44,71	41,74	48,25	48,94	48,36	37,74	40,47	35,13	-1,26	0,11	-2,61
Poland	40,16	40,22	41,99	48,44	48,71	50,20	31,87	31,73	33,78	1,83	1,76	1,91
Ukraine	36,45	35,72	37,62	39,06	38,91	41,05	33,85	32,53	34,19	1,17	1,99	0,34
III. Eastern European countries, including:												
Latvia	45,51	44,33	44,61	50,41	49,73	51,25	40,60	38,92	37,97	-0,9	0,84	-2,63
Lithuania	42,26	41,76	41,17	49,86	51,18	51,92	34,66	32,34	30,42	-1,09	2,06	-4,24
Estonia	52,81	51,73	50,93	56,78	54,15	56,99	48,83	49,31	44,87	-1,88	0,21	-3,96

Regarding the innovation introduction sub-index, this indicator increased in all the above European countries except France, where it decreased by 1.26. Instead, the innovation output sub-index has been declining in all European countries. Thus, it decreased in Germany by 11,13, in France – by 3,77, in the UK – by 14,36, in Spain – by 3,49, in Bulgaria – by 0,15, in Hungary – by 2,61 , in Latvia – by 2,63, in Lithuania – by 4,24, and in Estonia – by 3,96.

If it is planned to analyze the share of budget expenditures on innovation, this figure is not high in CEE countries (Poland – 0,88; Ukraine – 0,37). In the 2015-2017 period, the share of budget allocations across the EU 28 increased by 0,1%, in particular in Germany – by 0,1%, and in the United Kingdom – by 0,04%. In turn, this indicator decreased in Spain – by 0,03%, in Estonia – by 0,18%, and in Poland – by 0,1%. It is worth noting that the cost of R&D by sectors of GDP has decreased in most countries. Thus, this figure decreased in France by 0,08%, in the UK – by 0,01%, in Spain – by 0,02%, in Estonia – by 0,18%, and in Ukraine – by 0,1% (Table 3).

Table 3. Dynamics of the level of spending on R&D in European countries in 2015-2017 [31-34]

Country	Share of government budget appropriations or outlays on research and development			Research and development expenditure, by sectors of performance, % GDP			Intramural R&D expenditure (GERD) by source of funds.			Absolute deviation 2017 from 2015, +/-		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	1	2	3
Overall EU 28	1,3	1,38	1,4	2,04	2,04	2,06	55,3	56,6	-	0,1	0,02	-
Germany	1,99	2,05	2,09	2,91	2,92	3,02	65,6	65,2	-	0,1	0,11	-
France	1,14	1,11	1,14	2,27	2,25	2,19	-	-	-	-	-0,08	-
United Kingdom	1,26	1,27	1,3	1,67	1,68	1,66	49	51,8	-	0,04	-0,01	-
Spain	1,28	1,28	1,25	1,22	1,19	1,2	45,8	46,7	-	-0,03	-0,02	-
Estonia	1,72	1,7	1,54	1,47	1,25	1,29	41	48,2	-	-0,18	-0,18	-
Poland	0,98	0,8	0,88	1	0,96	1,03	39	53,1	-	-0,1	0,03	-
Ukraine	0,36	0,34	0,37	0,55	0,48	0,45	39,6	36,9	30,1	0,01	-0,1	-9,5

There is an increase in the share of research and development personnel by export activity in most countries in 2015-2017. Thus, this indicator increased in the EU – 28 by 0,06%, in particular in Germany – by 0,06%, in France – by 0,02%, in Estonia and Ukraine – by 0,1%, and also in Poland – by 0,2%. The opposite is observed with the share of high-tech exports in total exports of countries. Thus, this indicator decreased in Germany by 0,1%, in the UK – by 1,7%, in Spain – by 0,3%, in Estonia – by 4,1%, in Poland – by 0,1%, and also in Ukraine – by 2,2%. The same is true of patent applications to the European Patent Office (EPO) for the priority year, which in Germany decreased by 30,2 units/million inhabitants, in France – by 2,6 units/million population, in the UK – by 5,1 units/million population, in Estonia – by 1,54 units/million residents. In terms of the percentage of the ICT sector in GDP, it fell by 0,03% in Germany, by 5,9% in the UK, and by 3,1% in Poland (Table 4).

Table 4. Key indicators of high-tech development of European countries in 2015-2017 [34, 35]

Country	Research and development personnel, by sectors of performance, % before export			High-tech exports, % before export			Patent applications to the European patent office (EPO) by priority year			Percentage of the ICT sector on GDP			Absolute deviation 2017 from 2015, +/-			
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	1	2	3	4
Overall EU 28	1,21	1,23	1,27	17,8	17,8	17,9	112,5	109,7	106,8	-	-	-	0,06	0,1	-5,7	-
Germany	1,55	1,56	1,61	15,2	15,1	15,1	259	245	228,8	4,19	4,09	4,16	0,06	-0,1	-30,2	-0,03

France	1,46	-	1,48	12,7	20,6	20,5	144,4	143,1	141,8	3,9	4	4,3	0,02	7,8	-2,6	0,4
United Kingdom	1,3	1,3	1,3	18,4	18,1	16,7	87,7	84,7	82,6	5,9	5,9	-	-	-1,7	-5,1	-5,9
Spain	0,8	0,9	0,9	5,8	5,7	5,5	35,1	35,35	35,56	-	-	-	-	-0,3	0,46	-
Estonia	0,8	0,9	0,9	15,6	12,0	11,5	29,14	25,08	27,60	4,7	4,9	5,1	0,1	-4,1	-1,54	0,4
Poland	0,6	0,6	0,8	8,5	8,4	8,4	15,22	16,52	18,08	3,1	3,2	-	0,2	-0,1	2,86	-3,1
Ukraine	0,2	0,2	0,3	8,5	7,2	6,3	-	-	-	-	-	-	0,1	-2,2	-	-

However, the total innovation capacity of all CEE countries is lower than the innovation ability, as the index also includes the research work quality, educational institutions and enterprises cooperation, innovation expenditures and the production innovations implementation (Figure 2).

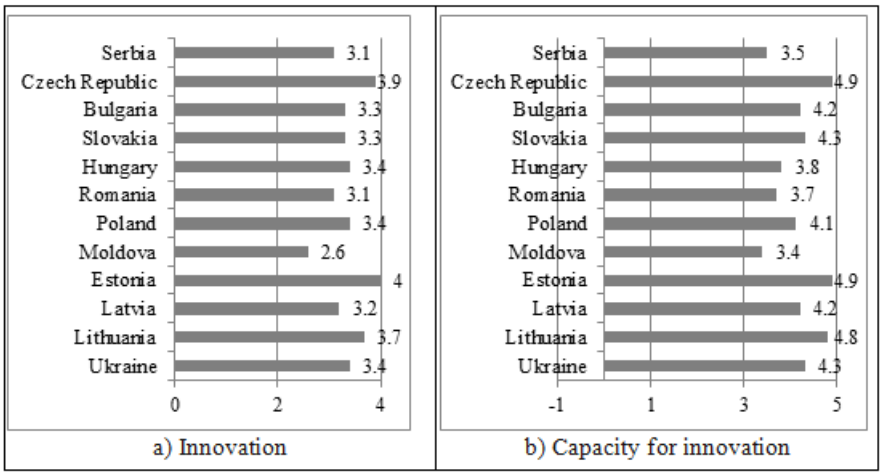

Figure 2. World Innovation Index Structure [27-29]

The most problematic issues are the implementation of innovations in the real economy, the use of scientific developments in production and the percentage of investment in enterprises innovations. All this reduces the total innovation index. It is obvious that the low innovation potential will not improve the image of the country.

5. DISSCUSSION

Seven countries were selected for the study, including Germany, France, the United Kingdom, Spain, Estonia, Poland and Ukraine. This study is based on 2017 indicators. When interpreting the results of correlation analysis, the size of the error should be p> 0,05. (Table 5, appendix 1).

Table 5. Matrix of selection of the most significant correlation factors of influence of factors on the global innovation index, general

No	Equation	Correlation coefficient
1	Y = -138,9 + 2,4349 * Sustainable Development Index	r=0,86
2	Y = 37,961 + 8,0338 * Expenditure on research and development by industry	r=0,80
3	Y = 52,532 - ,4954 * Inbound R&D expenditures by source of funds	r= -0,66
4	Y = 32,993 + 16,716 * Research and development staff by industry	r=0,89
5	Y = -0,6527 + ,89231 * Innovation sub-index	r=0,97
6	Y = -20,95 + 14,570 * Index of economic competitiveness	r=0,96

There is a very strong correlation between the Global Innovation Index and the Innovation Input Index (r=0,97) and the Economic Competitiveness Index (r=0,96). The strong correlation of the Global Innovation Index is traced to such factors as the Sustainable Development Index (r=0,86), R&D expenditure by industry (r=0,80), R&D staff (r=0,89) and the Sustainable Development Index (r=0,86). The scale of estimating the close relationship between Index Sustainable development and other factors by the correlation coefficient is given in Table 6.

Table 6. Magnitude of the correlation coefficient and close relationship between Index Sustainable development and other factors

Correlation coefficient (r)	Tightness of connection	Tightness of the connection between factors with sustainable development
1,00	Functional connection	Sustainable Development Index (r=1)
0,90-0,99	Very strong	Expenditure on research and development by industry (r=0,94) Research and development staff by industry (r=0,95) Competitiveness Index (r=0,90)
0,70-0,89	Strong	Share of budgetary allocations or expenditures for research and development (r=0,89) High-tech exports (r=0,77) Patent applications to the European Patent Office (EPO) by priority year (r=0,86) Global Innovation Index, general (r=0,86) Innovation Sub-Index (r=0,86) Inbound R&D expenditures by source of funds (r= -0,75) Percentage of ICT sector in GDP (r=0,73)
0,50-0,69	Considerable	-
0,30-0,49	Temperate	Innovative output sub-index (r=0,38)
0,10-0,29	Weak	-
0,00	No connection	-

In the case of inbound R&D expenditures, this factor has a negative impact on innovation, as evidenced by its negative association with all factors (Figure 3).

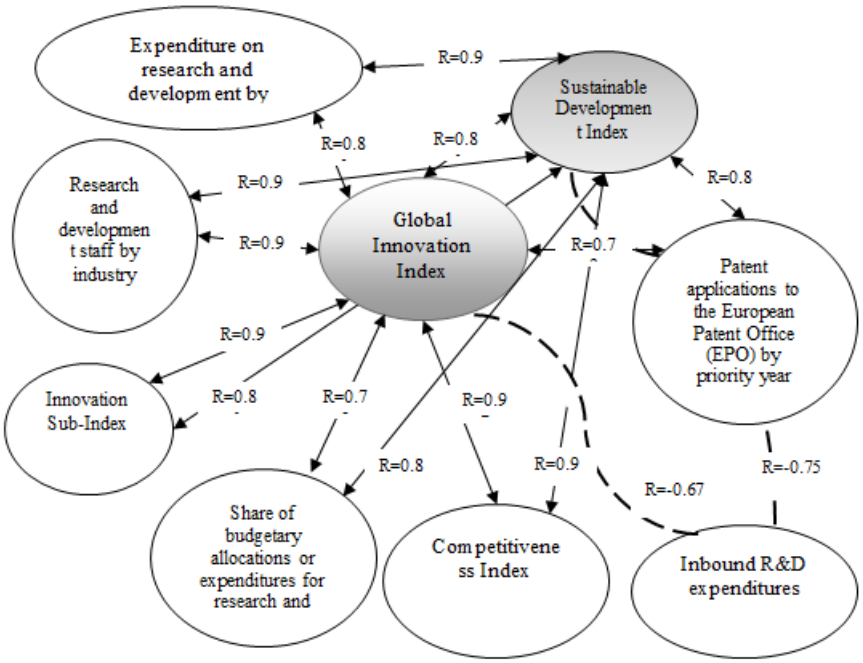

Figure 3. Relationship between factors influencing the global innovation index

Analyzing the impact of innovation on sustainable development, we see that most innovation activity has a significant impact on sustainable development. The most significant is the growth in the number of researchers and innovators (X_1) (r=0,95); total costs (financial investments) in innovation (X_2) (r=0,94). There is a positive correlation between global competitiveness (X_3) (r = 0.90) and sustainable development (Y). The proportion of each factor in the overall variation of the resultant characteristic can be determined by the coefficients of the separate determination:

$$\begin{cases} d_{21} = 0.95 * 0.765 = 0.73 \\ d_{22} = 0.94 * 0.297 = 0.278 \\ d_{23} = 0.91 * (- 0.0947) = -0.0858 \end{cases} \quad (1)$$

Equality must be respected:

$$\Sigma d_{i2} = R_2 = 0.923 \quad (2)$$

The standardized form of regression equation has the form 1:

$$Y = 73.2359 + 5.13X_1 + 1.07X_2\text{-}0.5148X_3 \quad (3)$$

Accordingly, an increase in X_1 by 1 unit leads to an increase in Y by an average of 5.13 unit; an increase in X2 by 1 unit leads to an increase in Y by an average of 1.07 unit; an increase in X_3 by 1 unit leads to a decrease in Y by an average of 0.515 unit. By the maximum coefficient $\beta_1 = 0.765$ we conclude that factor X_1 has the greatest influence on the result Y.

The main factors behind the impact of innovation on the sustainable development of states are the following:

- promoting the implementation of a proportional development rule that provides for a structure of reproduction that meets the needs of society;
- providing opportunities to expand the process of production of goods and services necessary to meet the existing needs of society;
- reduction of time and material resources for the development and production of new products through the introduction of innovative technologies;
- implementation of intellectualization of the labor process, increasing the level of human intelligence, increasing the complexity of labor activity in order to implement a set of laws to improve the productivity of labor and effective support of the production process.

In order to manage innovation and achieve Sustainable development goals, it is necessary to:

1. Adoption of innovation strategy at the state level to achieve sustainable development.
2. Encouraging the development of technologies that will reduce the negative impact on the environment, including low-resource technologies.
3. Simplification of patenting and licensing procedures for inventions and their introduction into production.
4. Encouraging the development of life-long research and education.
5. Increasing the overall level of innovation potential and the use of less risky technologies.
6. Promoting technology transfer and technology export.
7. Maximum involvement of members of society in the development, implementation and use of innovative technologies.
8. Stimulating the increase in the number of scientists and funding innovation at the national level.

6. CONCLUSION

The study found that without introducing innovations into the processes of state-building and without paying attention to the development of a strategy of innovative development of the state, given its geopolitical and national characteristics, it is impossible to achieve a satisfactory level of sustainable development of the state. Particularly acute is the problem of developing strategies for balanced development of the state through innovative growth, stabilization of geopolitics and knowledge economy. At the same time, participants in the innovation process should include individual interconnected, self-organized, self-governing units, or a network of self-organized, self-governing socio-economic structures, ie socio-economic entities that have an interest in the development and implementation of modern innovations and strengthen state innovation.

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[32] Research and development expenditure, by sectors of performance. https://ec.europa.eu/eurostat/databrowser/view/tsc00001/default/table?lang=en

[33] Research and development personnel, by sectors of performance. https://ec.europa.eu/eurostat/databrowser/view/tsc00002/default/table?lang=en

[34] Intramural R&D expenditure (GERD) by source of funds. https://ec.europa.eu/eurostat/databrowser/view/tsc00031/default/table?lang=en.

[35] Percentage of the ICT sector on GDP. https://ec.europa.eu/eurostat/ databrowser/view/tin00074/default/table?lang=en.

APPENDIX 1

Correlations (Spreadsheet3) Marked correlations are significant at p < ,05000 N=7 (Casewise deletion of missing data)

	Share of budgetary allocations or expenditures for research and development	Expenditure on research and development by industry	Inbound spending on R&D by source of funds	Research and development staff by industry	High-tech exports	Patent applications to the European Patent Office (EPO) by priority year	Percentage of the ICT sector in GDP	Global Innovation Index, general	Innovation Sub-Index	Innovation Exit Index	Index of economic competitiveness	Sustainable Development Index
Share of budgetary allocations or expenditures for research and development	1,00	0,84	-0,71	0,79	0,45	0,74	0,62	0,79	0,74	0,31	0,80	0,89
Expenditure on research and development by industry	0,84	1,00	-0,58	0,95	0,74	0,98	0,61	0,80	0,77	0,58	0,89	0,94
Inbound spending on R&D by source of funds	-0,71	-0,58	1,00	-0,72	-0,44	-0,41	-0,35	-0,67	-0,77	0,07	-0,71	-0,75
Research and development staff by industry	0,79	0,95	-0,72	1,00	0,83	0,89	0,53	0,90	0,91	0,54	0,96	0,95
High-tech exports	0,45	0,74	-0,44	0,83	1,00	0,71	0,57	0,77	0,77	0,51	0,80	0,77
Patent applications to the European	0,74	0,98	-0,41	0,89	0,71	1,00	0,55	0,73	0,67	0,68	0,83	0,86

Patent Office (EPO) by priority year												
Percentage of the ICT sector in GDP	0,62	0,61	-0,35	0,53	0,57	0,55	1,00	0,42	0,38	-0,03	0,43	0,73
Global Innovation Index, general	0,79	0,80	-0,67	0,90	0,77	0,73	0,42	1,00	0,98	0,61	0,97	0,86
Innovation Sub-Index	0,74	0,77	-0,77	0,91	0,77	0,67	0,38	0,98	1,00	0,50	0,95	0,86
Innovation Exit Index	0,31	0,58	0,07	0,54	0,51	0,68	-0,03	0,61	0,50	1,00	0,62	0,38
Index of economic competitiveness	0,80	0,89	-0,71	0,96	0,80	0,83	0,43	0,97	0,95	0,62	1,00	0,90
Sustainable Development Index	0,89	0,94	-0,75	0,95	0,77	0,86	0,73	0,86	0,86	0,38	0,90	1,00