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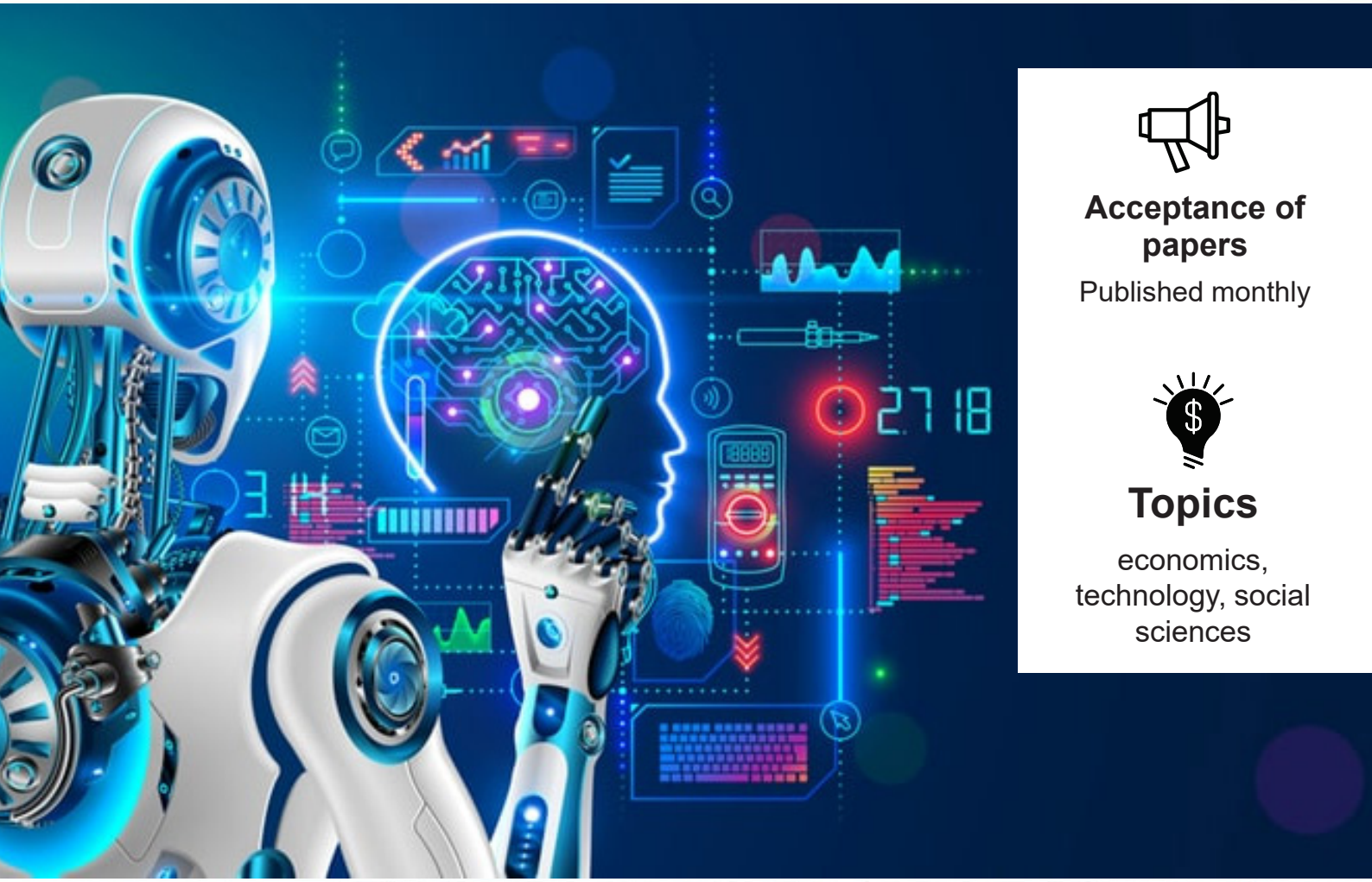

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CONTENTS

CONTENTS

ANALYSIS OF INNOVATION ACTIVITIES

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Abstract. The article analyzes the dynamics of innovation activity development in the Republic of Uzbekistan, as well as in the Namangan region. Statistical data for 2015–2024 are used to assess quantitative indicators of innovation activity (implemented innovations, expenditures on innovation and R&D, the number of performing organizations, and the share of innovations implemented by in-house efforts). Correlation analysis is applied to identify the relationships between resource investments and the effectiveness of innovation activity. The results show that in the Namangan region the key factor of innovation growth is the internal potential of organizations - innovations implemented by their own efforts - whereas total expenditures on innovation have a weak or negative impact. The article provides recommendations for stimulating an open innovation environment, strengthening the role of R&D, and improving the efficiency of investments.

Key words: innovation activity, innovations, correlation analysis, number of implemented innovations, innovation expenditures, R&D expenditures, number of R&D-performing organizations, technological innovations.

Annotatsiya. Maqolada O‘zbekiston Respublikasida, shuningdek Namangan viloyatida innovatsion faoliyat rivojlanishining dinamikasi tahlil qilinadi. 2015–2024 yillar uchun statistika ma’lumotlari asosida innovatsion faollikning miqdoriy ko‘rsatkichlari (joriy etilgan innovatsiyalar, innovatsiyalarga va ilmiy-tadqiqot va tajriba-konstruktorlik ishlanmalariga (ITTKI) sarflangan xarajatlar, ijrochi tashkilotlar soni, o‘z kuchi bilan amalga oshirilgan innovatsiyalar ulushi) baholanadi. Korrelyatsion tahlil yordamida resurs investitsiyalari va innovatsion faoliyat natijadorligi o‘rtasidagi o‘zaro bog‘liqliklar aniqlanadi. Olingan natijalar Namangan viloyatida innovatsiyalar o‘sishining asosiy omili tashkilotlarning ichki salohiyati — ya’ni o‘z kuchi bilan joriy etilgan innovatsiyalar ekanligini, umumiy innovatsiya xarajatlari esa sust yoki manfiy ta’sir ko‘rsatishini namoyon etadi. Maqolada ochiq innovatsion muhitni rag‘batlantirish, ITTKI rolini kuchaytirish va investitsiyalar samaradorligini oshirish bo‘yicha tavsiyalar keltirilgan.

Kalit so‘zlar: innovatsion faollik, innovatsiyalar, korrelyatsion tahlil, joriy etilgan innovatsiyalar soni, innovatsiyalarga sarflangan xarajatlar, ITTKI xarajatlari hajmi, ITTKIni amalga oshiruvchi tashkilotlar soni, texnologik innovatsiyalar.

Аннотация. В статье анализируется динамика развития инновационной деятельности в Республике Узбекистан, а также в Наманганской области. Используются статистические данные за 2015–2024 года, оцениваются количественные показатели инновационной активности (внедренные инновации, затраты на инновации и НИОКР, число организаций-исполнителей, доля инноваций, выполненных собственными силами). С помощью корреляционного анализа выявляются взаимосвязи между ресурсными инвестициями и результативностью инновационной деятельности. Полученные результаты показывают, что в Наманганской области ключевым фактором роста инноваций является внутренний потенциал организаций - инновации, внедренные собственными силами - тогда как общие затраты на инновации оказывают слабое или отрицательное влияние. В статье приведены рекомендации по стимулированию открытой инновационной среды, усилению роли НИОКР и повышению эффективности инвестиций.

Ключевые слова: инновационная активность, инновации, корреляционный анализ, количество внедренных инноваций, затраты на инновации, объем затрат на НИОКР, количество организаций, выполняющих НИОКР, технологические инновации.

INTRODUCTION

The reforms being implemented in the country are aimed at expanding sales markets, diversifying exports, and increasing the competitiveness of domestic products. These measures have established a stable trend toward the production of high-quality, value-added goods oriented toward export.

In recent years, amid global competition and accelerated technological transformation, the role of innovation in economic development has become fundamental. Innovation serves as a key driver of labor

productivity, product competitiveness, export capacity, and sustainable economic growth. In the context of the Republic of Uzbekistan, the development of innovative activity is of particular importance, as the country aims to modernize its industrial base, expand the export of high-technology products, and create an effective innovation ecosystem [1].

However, despite the overall growth in the number of registered innovations, it remains unclear how effectively investments and R&D activities are being transformed into tangible, sustainable technological change and economic outcomes. In this regard, it is necessary to examine not only the dynamics of innovation quantity but also the structure of expenditures, organizational capacity, and the nature of innovation implementation—whether carried out internally or with external resources.

The purpose of this study is to conduct a comprehensive analysis of innovation activity in Uzbekistan in general and in the Namangan region in particular, to identify the factors that exert the strongest influence on innovation performance, and to provide recommendations for enhancing the effectiveness of innovative activities.

To achieve this purpose, the following tasks have been set:

- Analyze the dynamics of implemented innovations in Uzbekistan for the period 2015–2024;
- Assess key indicators of innovation activity (expenditures, R&D, number of organizations, share of in-house innovations) for the Namangan region;
- Conduct a correlation analysis of the relationships between resource factors and innovation outcomes;
- Interpret the results obtained and formulate recommendations for transitioning toward a more open, efficient, and sustainable regional innovation system.

LITERATURE REVIEW ON THE TOPIC

In modern economic theory, innovation activity is viewed as a key determinant of sustainable economic growth and structural modernization. The classical concept of national innovation systems (NIS), developed by B. Lundvall and R. Nelson, emphasizes that innovation development is determined not only by the level of R&D expenditures but also by the quality of interaction among the state, the business sector, research institutions, and intellectual property systems. Within this framework, innovations emerge as the outcome of cooperation, knowledge exchange, and institutional synergy rather than as isolated results of individual investments [2].

Russian economist S. Yu. Glazyev interprets innovative development as a shift between technological paradigms, in which the concentration of resources in priority scientific and technological areas plays a decisive role. He stresses that “sustainable economic growth is impossible without relying on internal sources of scientific and technological development and effective mechanisms for knowledge commercialization” [3].

The development of regional innovation systems amid spatial economic differentiation has been extensively explored by A. G. Granberg. He argues that regions function as “growth poles” of the innovation economy, since it is at the regional level that the interaction between production, science, infrastructure, and human capital becomes most evident [4].

Within the framework of the open innovation concept, H. Chesbrough highlights that modern enterprises increasingly shift from closed models of innovation to network-based cooperation involving external sources of knowledge, universities, startups, and research centers. The open innovation model accelerates technological renewal and reduces innovation costs.

In the works of Uzbek scholars, the priority of an institutional approach to innovation development is also emphasized. R. Kh. Kholmuradov notes that “sustainable development of innovation activity in the regions of Uzbekistan is possible only through the creation of a favorable innovation infrastructure, the development of human capital, and an effective intellectual property protection system” [5].

Sh. I. Otajonov points out that a persistent gap remains in Uzbekistan’s regional economy between scientific potential and the real implementation of research outcomes in production, which significantly reduces the return on investment in R&D [6].

Regional-level studies demonstrate that innovation indicators—R&D expenditures, the number of R&D-performing organizations, and innovation intensity—have a significant impact on economic development. The study The Influence of Innovation on Social and Economic Development of the Russian Regions identifies a direct relationship between innovation parameters and gross regional product (GRP) [7]. Another work, Innovation Indicators and Regional Growth in Russia, shows that integrated econometric analysis using factor and regression methods helps identify key determinants of innovation activity at the regional level—an approach that can be adapted to Uzbekistan’s context [8].

Methodologies for assessing the efficiency of regional innovation systems are proposed, for example, in Assessing the Effectiveness of the Innovation System of the Far Eastern Federal District Regions, which applies an “input–output” framework (expenditures → results) and calculates an innovation efficiency coefficient.

In Uzbekistan's context, the shaping of an innovation environment, institutional support mechanisms, the development of intellectual property systems, and enterprises' involvement in R&D play a critical role [9].

Overall, the literature indicates that innovation activity should be viewed not merely as a function of financial investment but primarily as a result of institutional interaction, governance quality, cooperation levels, and the efficiency of technology transfer. Innovations in regional economies become effective when institutional support, R&D investment, organizational participation, and rigorous econometric evaluation are appropriately combined.

RESEARCH METHODOLOGY

The methodological basis of the study consists of dynamic, structural, and correlation analysis methods used to assess innovation activity. A systemic and institutional approach is applied, allowing innovation activity to be examined as a set of interrelated economic, organizational, and scientific-technological processes.

The information base includes official statistical data for 2015–2024 on the following indicators: the number of implemented innovations, expenditures on innovation and R&D, the number of organizations conducting R&D, and the number of innovations implemented independently. To identify relationships between the indicators, correlation analysis is used, enabling the determination of the degree of consistency between changes in resource-related and performance-related parameters of innovation activity.

RESULTS AND DISCUSSION

The main indicators characterizing the development of innovation activity include: the number of implemented innovations, expenditures on innovations, the volume of R&D expenditures, the number of organizations engaged in R&D, and the number of technological innovations implemented independently.

In 2024, the number of implemented innovations in Uzbekistan totaled 5,521, of which 4,889 were technological, 240 were marketing, and 392 were organizational innovations.

Table 1 presents the total number of implemented innovations in the Republic over the last ten years (from 2015 to 2024).

Table 1. Number of Implemented Innovations in the Republic

Year	Total	Technological	Marketing	Organizational
2015	1,819	1,737	36	46
2016	1,906	1,816	51	39
2017	2,016	1,946	32	38
2018	2,558	2,482	42	34
2019	4,568	4,427	128	13
2020	4,290	4,011	202	77
2021	4,148	3,936	145	67
2022	3,762	3,417	113	232
2023	8,033	7,530	270	233
2024	5,521	4,889	240	392

As shown in Table 1, during the period from 2015 to 2024 Uzbekistan experienced a positive trend in the number of implemented innovations. The total number increased from 1,819 in 2015 to 5,521 in 2024, indicating growing innovation activity in the country. The most significant rise occurred in 2023, when the number reached 8,033 innovations—almost 4.5 times the 2015 level. However, in 2024 the number declined by 31.3% compared with the previous year.

Technological innovations traditionally make up the largest share of all implemented innovations. Their number increased from 1,737 in 2015 to 4,889 in 2024. However, starting from 2020, there has been relative diversification in the structure of innovations due to the rise in marketing and organizational innovations. The number of organizational innovations increased more than eightfold (from 46 in 2015 to 392 in 2024), indicating growing attention to internal management processes and digitalization.

Against the backdrop of overall growth, 2023 stands out as the peak of innovation activity, particularly in technological innovations (7,530 units). Figure 1 shows the graph illustrating the dynamics of implemented innovations in Uzbekistan by type from 2015 to 2024.

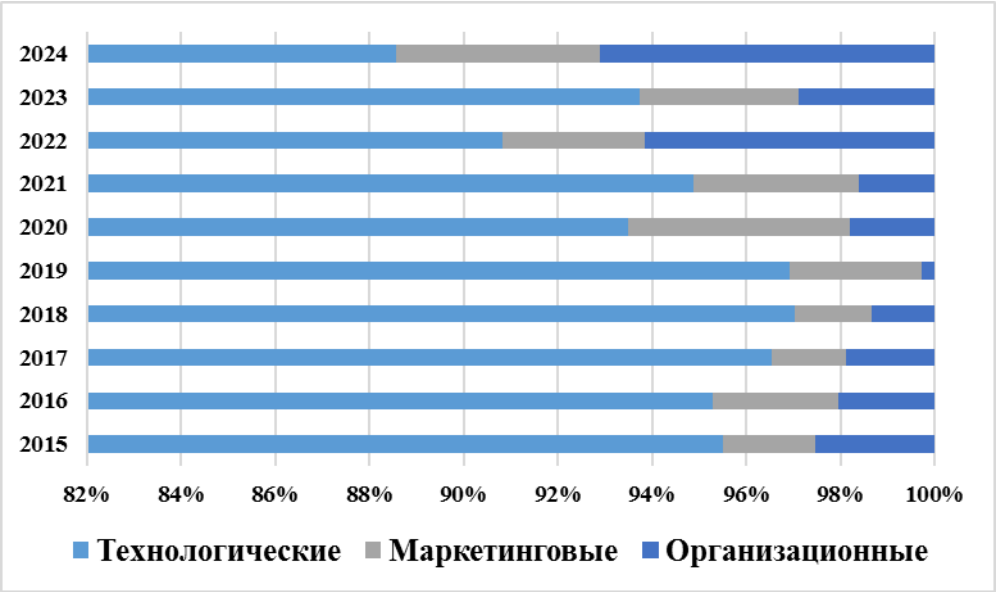

Figure 1. Structure of Implemented Innovations by Type in Uzbekistan (2015–2024)[1]

Table 2 presents the key indicators characterizing the development of innovation activity in the Namangan region, where:

x_1 – implemented innovations (units);
x_2 – total expenditures on innovations (million UZS);
x_3 – expenditures on research and development (R&D) by sectors (million UZS);
x_4 – number of organizations engaged in research and development (units);
x_5 – innovations implemented independently (units).

Таблица 2. Key Indicators of Innovation Activity in the Namangan Region[2]

Year	x_1	x_2	x_3	x_4	x_5
2015	54	42829,9	1674,8	10	48
2016	57	23836,5	5482,8	9	51
2017	60	52668,2	3670,9	10	55
2018	74	134051,7	3471,0	10	67
2019	130	207962,5	8424,9	9	81
2020	127	49734,5	1136,3	2	127
2021	124	45817,1	3599,2	4	112
2022	112	34089,2	6014,0	3	104
2023	108	63000,2	8111,1	7	59
2024	160	43000,0	8500	5	94

To demonstrate the interrelationship between the indicators under study across the regions, a correlation heatmap matrix is applied. The correlation coefficients range from –1 to 1, where:

- values close to 1 indicate a strong positive correlation;
- values close to –1 indicate a strong negative correlation;
- values close to or equal to 0 indicate the absence of a correlation relationship.

Table 3 presents the correlation heatmap matrix showing the relationships among the key indicators of innovation activity in the Namangan region.

1 Prepared by author
2 Источник: таблица составлена автором на основе данных Агентства статистики при Президенте Республики Узбекистан, предоставленных на сайте stat.uz

Table 3. Correlation Heatmap Matrix of Innovation Activity Indicators in the Namangan Region [3]

Показатели	x_1	x_2	x_3	x_4	x_5
x_1	1	0,17	0,48	-0,71	0,76
x_2	0,17	1	0,30	0,38	-0,06
x_3	0,48	0,30	1	0,02	-0,10
x_4	-0,71	0,38	0,02	1	-0,91
x_5	0,76	-0,06	-0,10	-0,91	1

Based on Table 3, a strong positive correlation (r = 0.76) is observed between the number of implemented innovations and the number of innovations developed independently. This indicates that innovation activity in the Namangan region is primarily driven by in-house developments and focused on internal innovations. Consequently, the region exhibits a closed type of innovation activity, highlighting the need for effective measures to transition to an open innovation model, which represents the development potential of the Namangan region.

A moderate correlation is observed between the number of implemented innovations and R&D expenditures (r = 0.48), between R&D expenditures and the number of organizations performing research and development (r = 0.38), and between total innovation expenditures and R&D expenditures (r = 0.30).

A weak correlation (r = 0.17) exists between the number of implemented innovations and total innovation expenditures, indicating that investments and funding in innovation activities do not fully translate into results.

Negative correlations are noted between the number of organizations conducting R&D and independently implemented innovations (r = -0.91), as well as between the number of R&D-performing organizations and the total number of implemented innovations (r = -0.71). This suggests a lack of effective interaction between these organizations and the entrepreneurial sector.

As shown in Table 3, the number of independently implemented innovations is close to the total number of implemented innovations, reflecting the formation of a self-sufficient innovation environment in the region.

CONCLUSION AND SGGESTIONS

The analysis of the level of innovation activity revealed several key issues:

- a lack of interest among business entities in obtaining intellectual property rights and patenting their ideas and developments;
- insufficient knowledge in patenting and generating additional revenue from the commercialization of intellectual property;
- limited awareness of the importance of patenting intellectual activity to protect against counterfeit products [10].

One of the main limitations of innovation activity analysis is that it does not allow for assessing the effectiveness of the implemented innovations, evaluating profits, losses, expenditures, or the competitiveness of the products produced.

The conducted analysis indicates that innovation activity in the region is largely formed according to a closed-type model, where the internal potential of enterprises plays a key role. Despite the growth in absolute numbers of implemented innovations, institutional constraints remain, limiting the active involvement of research organizations in innovation processes.

The insufficient level of cooperation between entrepreneurial innovation and scientific research reduces the efficiency of funds allocated to R&D and limits the opportunities for commercializing scientific developments. Therefore, the priority directions for enhancing innovation activity include the development of technology transfer mechanisms, the formation of regional innovation clusters, stimulation of patenting activity, and improvement of the intellectual property protection system.

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